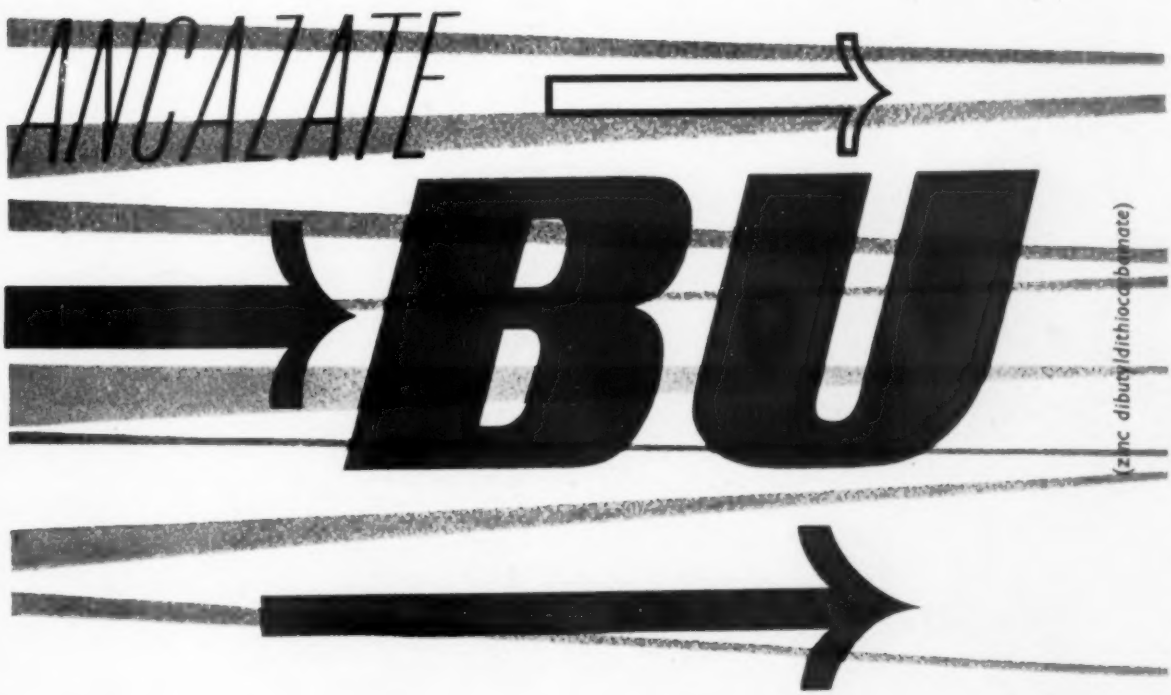
Rubber Journal and International Plastics

VOL. 139 NO. 6 AUGUST 6 1960 Price 1s. Weekly



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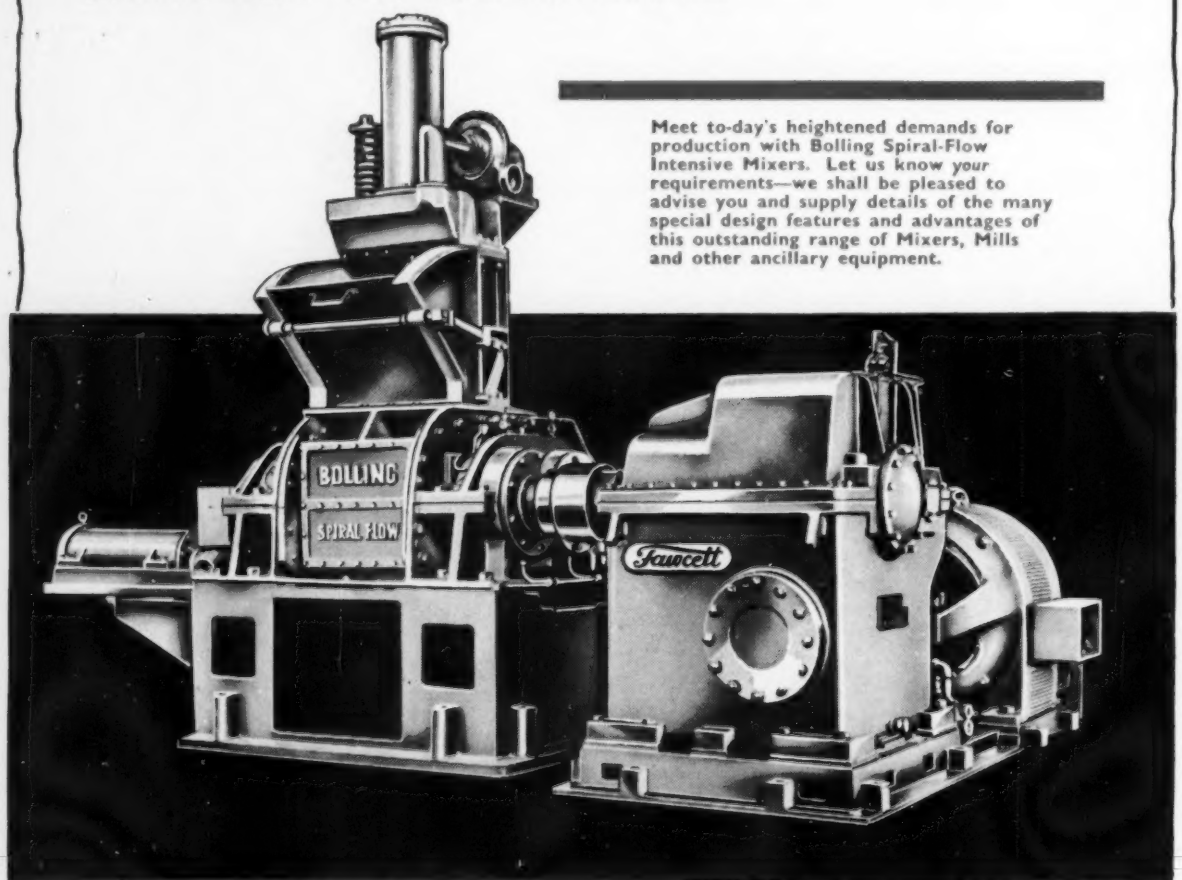

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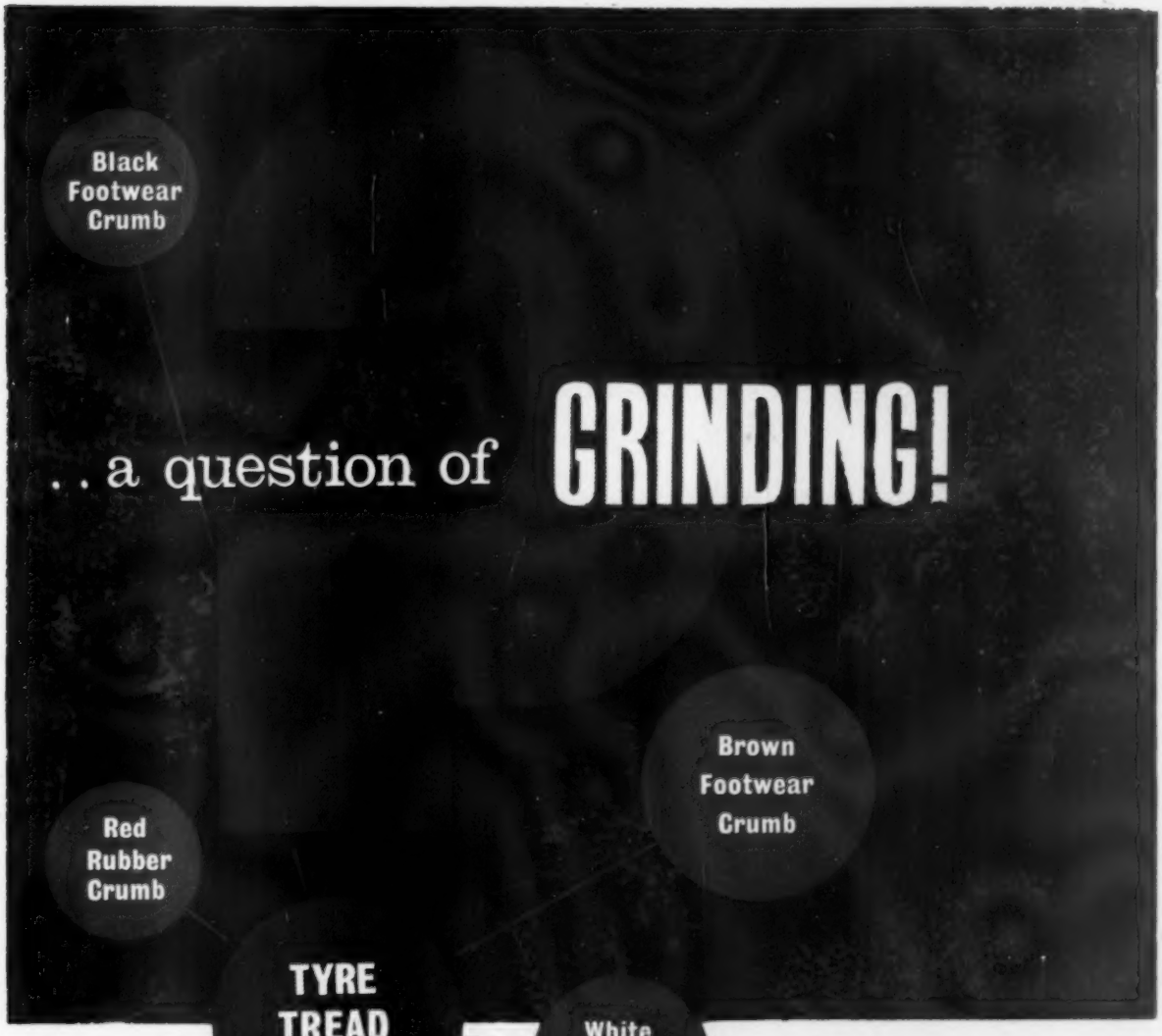

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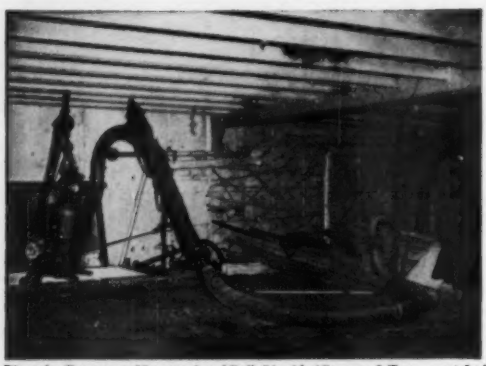

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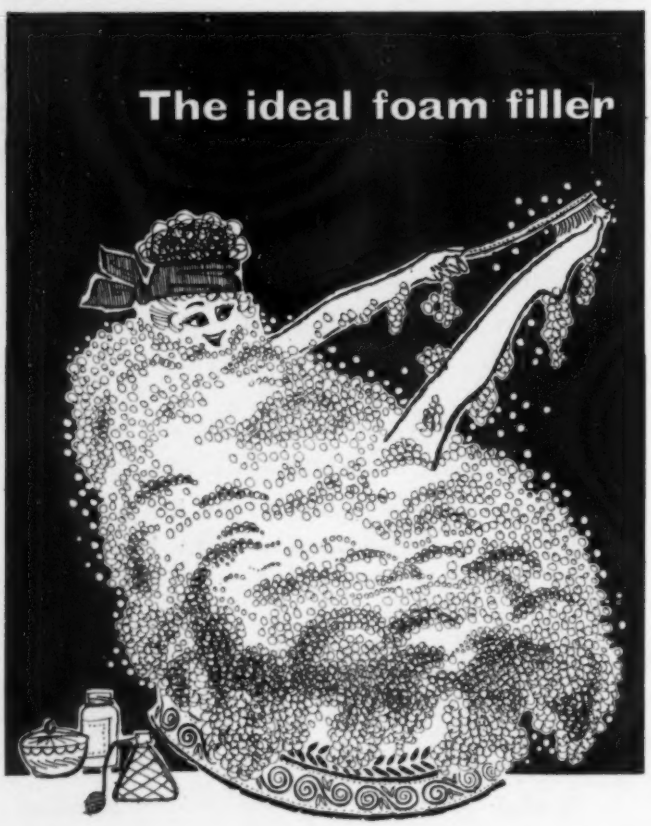

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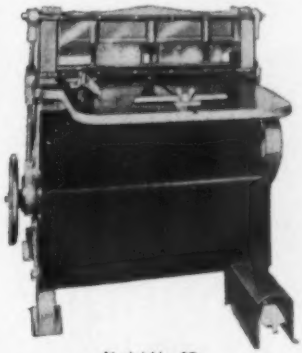

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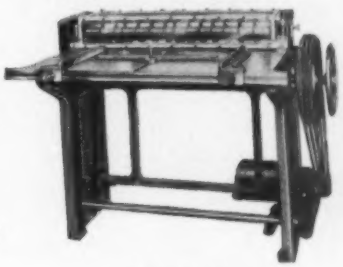

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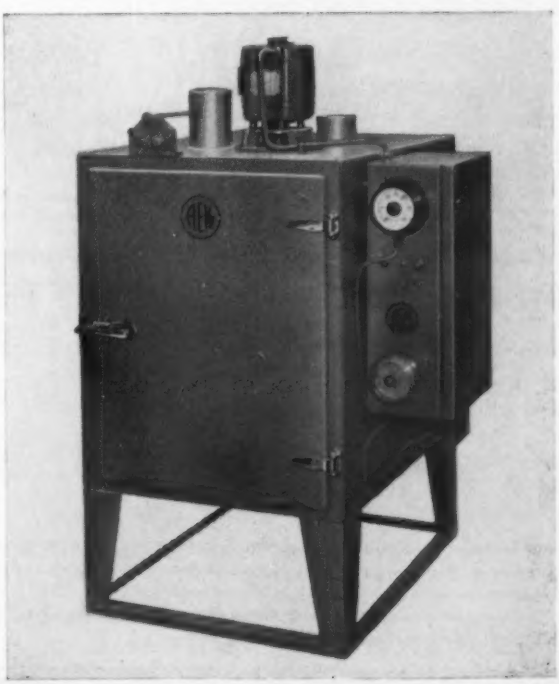

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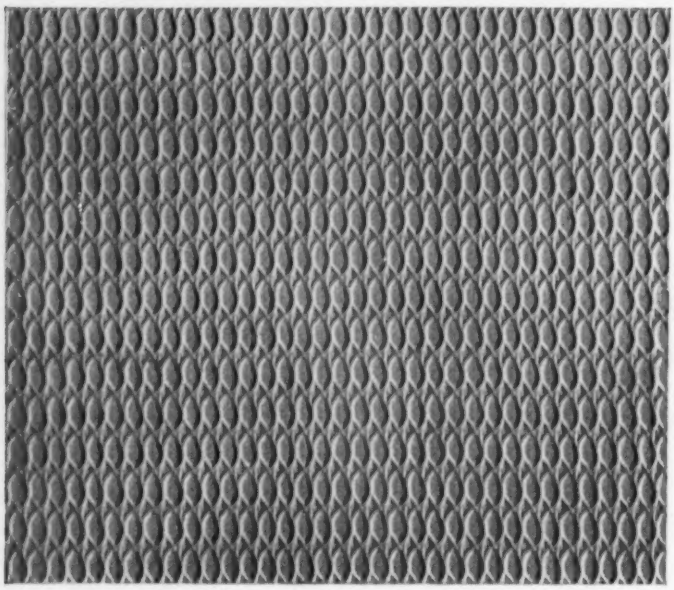

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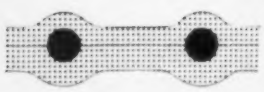
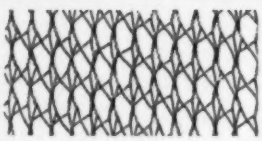


An enlarged illustration showing p.v.c./Terylene/p.v.c. construction of Plastolene.



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	Weft	*230*
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Volume 139 | Price 1s. Post free 1s. 4d. | No. 6
IN ITS 77th YEAR

August 6 1960

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NOTES of the WEEK

SR Round-up

THE formation of a synthetic rubber industry group, the International Institute of Synthetic Rubber Producers, announced last week in New York, is another indication of the world-wide growth of the industry. Over the 12 months of 1959 world consumption of all rubbers totalled 3,685,000 tons, of which 2,110,000 tons was natural and 1,575,000 tons synthetic. If, however, the figures for the 12 months ending March 1960 are taken, the figures are as follows: natural, 2,102,500 tons; man-made, 1,630,000 tons, for a total of 3,732,500 tons.

Last year man-made rubber production totalled 1,640,000 tons, excluding that of Russia. If Russia is credited with a capacity of 500,000 tons, world productive capacity for synthetic can be put at over 3 million tons annually. Apart from plans for increased outputs of general-purpose and other synthetic rubbers, new types, such as *cis*-polyisoprene and polybutadiene, are soon going to swell the total output. The molecular structure of the former is to all intents and purposes identical with that of natural rubber. These rubbers can be produced to sell at prices from 30 to 35 cents per lb. (26-30½d.). Seven companies in the USA are interested in their production and most of the plants are not far short of coming on stream and one, Shell, has been in commercial production for some time. In Europe, Shell, at Carrington, are already building a plant for manufacturing these rubbers and there are projects in France, Société des Elastomères de Synthèse, and in Germany, Buna Werke Huls.

Grand Total

DIVIDED into areas, North America has by far the largest synthetic rubber manufacturing capacity, something approaching 2 million tons in the USA and 160,000 tons at the Polymer Corporation plant at Sarnia, Canada. In Europe, Common Market countries have a production capacity at present of some 300,000 tons, made up of Germany, 150,000 tons; Italy, 70,000; Holland, over 60,000; and France, 20,000 (with another 50,000 due next year). Russian synthetic rubber capacity is something of a mystery; it could be anything between 500,000 tons and three times that figure. The United Kingdom, with a productive capacity of about 90,000 tons annually, is the only EFTA country with manufacturing facilities.

Most, if not all, of these countries plan extensions to existing plant or the erection of new ones. A number of other countries have plans, announced at various times in *RJIP*, for building plants. These include Poland, Brazil, India, Israel, Mexico, Argentine, Rumania and South Africa. Japan has two plants, total productive capacity 80,000 tons, shortly due to come on stream, and there is a 35,000-ton plant building in Australia and scheduled for production next year. It is unlikely, all things considered, that all the projects will come into being, even if one thinks as far ahead as 10 years. If they did so, annual world production of synthetic in 1970 would be very considerably over 5 million tons.

However, whatever transpires, there is no doubt that the International Institute of Synthetic Rubber Producers, stated to have 15 members at present, looks like becoming a fair-sized club. The Institute, founded by Mr Bancroft Henderson, president for three years until 1958 of the American Synthetic Rubber Corporation, aims to promote international trade in synthetic rubber and to provide a means of exchange of technical ideas.

Export Plastics

EMPHASIS is being laid once more on the need for British industry to step up the export effort. This is surprising only by reason of the fact that emphasis is necessary. Some sections of both our industries are a bit backward in coming forward to have a go at the export market. One of the obstacles raised is that of inability to compete, in particular markets, on the grounds of price. Many plastics moulders, for instance, would think it impossible to compete with their counterparts in the United States, although some might agree that there is considerable scope there for specialist moulding. There are, however, plastics moulders in the UK who are competing successfully in lines that cannot really be labelled specialist. They are carrying out top quality work, and that is where the accent must be, on contract and find that this can be done competitively in spite of Atlantic freight charges. There are equally possibilities in Europe, even in consumer goods, but, as has been mentioned in connection with other industries, manufacturers must be willing to study and fall in with Continental styling.

NEWS *Briefs*

£7m. POLYISOPRENE INVESTMENT AT PERNIS
ARGENTINE INSTITUTE FORMED — IRAQ PLAN
EPIKOTE PRICE REDUCED — STOCKPILE SALES

●**Yugoslavia** — The United States Development Loan Fund recently approved a loan of up to $23m. for the establishment of a plastics and chemical plant at Zagreb.

●**India** — A manufacturing licence for nylon yarn has been granted to a concern which is to set up a factory near Bulsar in Gujerat. The promoters are said to be negotiating with Dutch and West German firms. Caprolactam, the monomer for nylon 6, will be produced.

●**United Kingdom** — Exports of rubber manufactures to Europe for the first quarter of this year were well up on 1959 figures, for both EFTA and Common Market countries. May exports to EFTA countries were £569,000 and to the EEC area £522,000.

●**Brazil** — Resana S.A., Industrias Quimicas is building a new factory at Sao Bernardo near Sao Paulo, where sebacic acid from castor oil will be produced under licence from Wallace and Tierman Inc. Resana's present production is almost entirely synthetic resins, and its capital is at present Cr.$108m. Reichold Chemicals is a major shareholder. W. R. Grace, of New York have bought control of the firm of Industria Quimica de Produtos Ftalicos S.A., of Sao Paulo, which has a factory for the production of phthalic acid at Mogi das Cruzes, about 30 miles from Sao Paulo.

●**Argentina** — A group of Argentine rubber technologists have associated in order to form a technical institution. Known as the Instituto Argentino de Elastomeros, its aims are to promote the knowledge of rubber science and technology; technological development and scientific research; and the training of scientists and technologists. It will establish connexions with similar institutions and collaborate with national and foreign standardization institutes.

●**United Kingdom** — Following their polystyrene price cut last week, Shell have now announced another reduction. Cuts of from 4 to 7% in charges for solid grades of 'Epikote' epoxy resins took effect on August 1. The reduction per ton of each grade is £25 for 'Epikote' 1001; £31 for 1004; £42 for 1007; £28 for 1009.

●**United States** — Goodyear and Firestone have concluded an agreement with the rubber workers' union for a 9½ cents hourly wage increase. Reached under wage re-opener clauses in a two-year contract, the agreement affects about 39,000 employees, and is expected to spread to another 130,000 under talks now in progress.

●**Iraq** — The Iraqui Government is reported to have requested Japanese technical assistance in the setting up of a complex of plants, one of which will manufacture plastics.

●**Philippines** — Sale of the Government-owned Maria Cristina fertilizer plant to the Marcelo Tire and Rubber Co. has been approved by the Government. The agreed price was 12m. pesos. This is in line with the Government's policy of getting out of businesses which private interests are willing to take over. All employees are being retained.

●**Holland** — Construction of the new polyisoprene plant on the Shell site at Pernis has now begun. It will manufacture both the monomer and the polymer and represents an investment of £7m. Capacity will be 25,000 tons a year, and the plant is expected to be on stream in 1962.

●**Japan** — Japanese consumption of polythene during the whole of 1960 is expected to be 72,000 tons. Of this, it is estimated that 32,000 tons will be imported.

●**United Kingdom** — Sales from the Board of Trade's stock of natural rubber in July totalled 3,521 tons, leaving 35,474 tons available for sale. The sales were for delivery: spot 615 tons, August 190 tons, September 861 tons, October 1,855 tons. The Board of Trade sold 13,302 tons in June from its stockpile.

●**United States** — The General Services Administration have announced that July sales of stockpile rubber totalled 8,271 long tons, compared with 5,583 tons sold in June. About 81,580 long tons have been sold since sales began on October 16 1959.

●**France** — As anticipated, shares of Courtaulds were for the first time quoted on the Paris Bourse on August 2. They opened at New Frs.38.85 and closed at 38.65.

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Shell to Market Polyolefin Film

JOINT VENTURE WITH US CONCERN

THE Royal Dutch-Shell group is to enter into the plastics packaging field. An announcement from Shell International Chemical Co. in London said that a new company is being formed 'to develop plans for the production and marketing of polyolefin film and plastic packaging materials outside the USA and Canada.'

The new company will be a joint venture between Shell International Chemical and National Distillers and Chemical Corp., New York. It will be the first time that Shell has taken an interest in producing finished products in the plastics field.

National Distillers is one of the world's largest producers of polythene and owns the Kordite Co., a leading manufacturer of packaging film in USA. It has also recently set up a company in Switzerland to cover sales and development of polythene.

Carrington Capacity

When present plans are completed at Shell's plant at Carrington, near Manchester — which should be next year — the polyolefin capacity will be 30,000 tons. This figure is composed of polythene and polypropylene.

The project is at an early stage, and neither the name of the company, nor its initial capacity has been decided, but the headquarters will be in London.

The company will be headed by Dr W. L. J. De Nie, currently a senior executive of Shell Development Company, New York. Dr De Nie's deputy will be Mr Werner T. Meyer, who is at the moment in charge of Kordite's foreign operations.

macroPlastic 1960

News from the organizers of macroPlastic 1960, the International Plastics Exhibition to be held at Utrecht, Holland, October 19-26, is that more than 600 entries from 17 countries have been received. Participation by the various countries is as follows: The Netherlands, 31%; Germany, 26%; Great Britain, 13%; Belgium, 11%; the United States, 7%; France, 4%; Italy, 2%; Switzerland, 2%; other countries, 4%.

BIP FORM MEXICAN COMPANY

British Industrial Plastics, in conjunction with the Borden Co. of USA, is setting up a new company in Mexico. This will establish plant near Mexico City for the manufacture of amino moulding compounds. It is understood that a Mexican interest is being invited to join in the new venture.

BIP will be responsible for designing the plant and for supplying technical information to the company, which has been called Materiales Moldeables S.A. de C.V.

The factory is expected to be in production in 1961, and will have an initial capacity of 1,000 tons of amino moulding compounds a year.

Rubber for Motor Industry

A new division of Phoenix Rubber Co. Ltd., of Slough, Bucks., is now manufacturing rubber to metal bonded components. Supplies to British and overseas motor manufacturers have already commenced and many other industries are showing interest.

Airline Order

Goodyear tyres, wheels, brakes and anti-skid equipment have been specified for 23 Vickers Vanguard type 952 aircraft ordered by Trans-Canada Airlines.

The wheels and brakes have been manufactured by Goodyear in the USA, while the tyres and anti-skid equipment have been supplied by the company in UK. A three-way Goodyear interest in the order was established with an agreement that after-sales service should be furnished by Goodyear-Canada.

Monsanto Polystyrene

As previously indicated (*RJIP* July 30, 157) the price of Monsanto's Luxtrex GP crystal polystyrene and colours has been reduced by 3d. per lb., following price reductions of the material by Shell Chemical. The price of all toughened grades remains unchanged.

Metallized Film Development

THE first comprehensive range of metallized materials to become available from a company engaged mainly in the packaging, converting and allied fields, has been introduced by E. S. and A. Robinson Ltd. Early last year Robinsons installed high vacuum metallizing plant at their Bristol plant.

The rolls of metallized materials immediately available include non-toxic unplasticized PVC films — for example, the 'improved clarity' Craytherm manufactured by Greenwich Plastics Ltd.—in calipers ranging from .001in. to .020in., the heavier calipers being suitable for vacuum-formed trays and packs; cellulose acetate film up to .0075in. for boxes or for box lids and edges; cellulose acetate (.001in.) for laminating to paper or board for labels, swing tickets and general display and packaging work; cellulosic films which can be coated on the unmetallized side with heat seal lacquer for use as wrappers; and various polyester and polyamide films.

Metallized film is competitive with ordinary foil for some purposes, but there are many other uses to which such materials are put, particularly where the material itself has certain characteristics, such as protective qualities, which can be used to enhance the inherent advantages of foil.

Besides uses in packaging and display work there are electrical applications—such as for lamp reflectors and cable insulation — and wide uses in the building trade and toy industry.

German Tyre Equipment for Brazil

Among the financing operations registered with the Superintendência da Moeda e do Crédito, of Brazil, earlier this year, figured the importation of equipment from Western Germany worth DM.1,300,000 by the Cia. Brasileira de Artefatos de Borracha for its tyre plant. Payments would be spread over eight years after the date of approval of the contract by the SUMOC.

The 10th Canadian High Polymer Forum, co-sponsored by The Chemical Institute of Canada, 42 Rideau Street, Ottawa 2, Ontario, Canada, and the National Research Council, Ste. Marguerite, Quebec, will be held on September 7-9 1960.

Progress in Polymer Research

METHODS FOR SYNTHESIS AND PRODUCTION

THREE techniques are now available to prepare polythenes of different specific gravity—from 0.925 to 0.970—corresponding to different CH_2 : CH_3 ratios, *i.e.* different degrees of short chain and long chain branching.

An examination of these techniques was given in a lecture by Dr Herman Mark, director of the Polymer Research Institute, Brooklyn, USA, at the Macro-Molecular Symposium held recently in Moscow.

The free radical initiated polymerization of ethylene with or without the presence of an organic liquid as solvent or vehicle, at temperatures above 100°C. and at pressures around 1,000 atmospheres leads to materials of densities in the range from 0.925 to 0.935. Oxygen or peroxides of relatively high decomposition temperatures are used as initiators. If more labile peroxides of the percarbonate or perborate type are used and the pressure is increased to about 1,500 atmospheres, the temperature can be lowered as far down as 45°C. and polymers are obtained the specific gravities of which range up to 0.960.

Ziegler type catalysts based on $TiCl_4$ and Al trialkyls cover the density range from 0.935 to 0.975, by the appropriate choice of the Ti-Al ratio of the initiator, the character of the solvent and the temperature.

Finally, activated Al- or Ti-oxide catalysts used as fixed or fluid bed systems give essentially polymers in the specific gravity range above 0.955, but this can be brought down to the lower range by the incorporation of 3-6% of propylene or butylene with the aid of copolymerization.

α-Olefin Polymers

About half a dozen companies are producing isotactic polypropylene (MP up to 171°C.) at a rate of about 150m. lb. in 1960. Its use for moulding and extrusion is already well established and its successful application in the fibre sector has recently been aided by the developments of several methods to facilitate the dyeing of such fibres. Grafting of vinylpyrrolidone and acrylic acid with the aid of radiation or peroxides increases the moisture regain, the hand and the dye take up. Incorporation of cavities and capillaries in the fibre with a small amount of a blowing agent also allows dyestuff molecules to diffuse into the interior of the fibre where they eventually can be sealed in by a heat setting treatment.

Other stereoregulated polypropylenes have been prepared by the use of $TiCl_3$, $AlCl_2Et$ and a stereomodifier such as PPh_3 or $OP[N(CH_3)_2]_3$. It is not yet clear whether these polymers are syndiotactic or represent another, more complicated type of stereoregulation; moduli of rigidity up to 300,000psi and melting points of about 185°C. have been reported.

Isotactic polybutadiene has been prepared in larger quantities and successfully tested as self supporting film and for moulding and extrusion; it combines a melting point of about 130°C. with excellent low temperature behaviour and remarkably good resistance against stress cracking. The use of stereoregulators will probably permit the preparation of a syndiotactic species which ought to have a melting point around 150°C.

Higher melting olefin polymers such as the isotactic poly-4-methyl pentene (MP above 200°C.) and the isotactic poly-neo-hexene are still in a state of relatively small scale exploration; they appear to combine high modulus, high melting point and high tensile strength with good low temperature behaviour and with a fair rate of crystallization and would certainly achieve commercial importance if methods were found to produce the monomers at low cost.

Stereoregulated Polymers

Low temperature free radical and ionic initiated polymerization techniques have led to the preparation of syndiotactic polyvinylesters, polyvinylalcohol, polyacrylates and polymethacrylates. Syndiotactic polyvinylalcohol is a high melting, crystalline and water insoluble material which can be spun and drawn into fibres of high rigidity and exceptional strength; it must be considered as a very prominent candidate for a tyre cord. The iso- and syndiotactic polymethacrylates are hard, high softening resins which crystallize only reluctantly but are resistant to solvents even in the amorphous state and offer promising applications as films and coatings.

Syndiotactic polyacrylonitrile has been reported as a result of the polymerization of the monomer with Ziegler type catalysts which contain Cr and V organic compounds such as esters or acetylacetonates together with alkyls or aryls of Zn, Cl and Al. The polymer is still soluble in dimethylformamide; a more detailed study of its fibre or film forming properties is now under way but not yet completed.

High 1,4-cis polybutadiene is now being produced with the aid of Ziegler type catalysts by several companies and tested alone and in combination with other elastomers as a component for tyre manufacture. If used alone this polymer exhibits some weakness in creep and stress cracking but together with natural rubber, high 1,4-cis polyisoprene and GR-S it gave tyres which showed excellent performance in abrasion resistance, road wear and heat generation.

High 1,4-cis polyisoprene is now being put on the market by a number of companies which partly use Ziegler type catalysts, partly Li metal and Li alkyls. Its properties are excellent and in every respect identical or even slightly superior to those of natural rubber. The price of this material is below that of natural rubber and could be still lower if the price of monomer were less than it is now. As a consequence, considerable effort is now concentrated on the development of a simple and inexpensive synthesis for isoprene.

α-Olefin Copolymers

The introduction of relatively small amounts of propylene or butylene into polythene leads to a softening of the polymer and to a considerable improvement in its stress-cracking characteristics, larger proportions of the C_3 or C_4 component (above 20-25%) produce rubbery materials with a wide range of interesting properties. Since elastomers of this type are based on the least expensive monomers—ethylene, propylene and butylene—it can be foreseen that their price would become very low if the details of their large scale production were developed. Carbon black filled and peroxide cured compositions of these C_{233} rubbers have been tested alone

and together with other elastomers. Some of these samples showed excellent resistance against abrasion, swelling in organic solvents and deterioration through the action of oxygen in light. They also gave good traction and sufficient resiliency but appear to have a relatively high development of heat in the temperature range around 100°C. It may be that this behaviour is caused by the presence of a stereo block structure in which short sequences (8-12 monomers) of polythene and isotactic polypropylene alternate with each other. It would seem that a more random distribution of the two or three monomers along the length of the chain would eliminate processes of reversible local crystallization and melting and, therefore, lead to a more favourable hysteresis behaviour.

Polyacrolein

Although acrolein has been known for a long time and could be available at a remarkably low price it was not considered to be a very attractive and useful monomer. Earlier attempts to polymerize it by free radical or ionic catalysis have usually led to gelatinous or hard insoluble and intractable materials which obviously were highly cross-linked and did not show any inviting mechanical or chemical properties. Recently, however, it was found that acrolein could be polymerized through the activation of the carbon-carbon double bond to linear macromolecules within a wide range of polymerization degrees. Their chains contain long sequences of aldehyde groups attached to a carbon-carbon backbone chain; their structure was proved by the fact that oxidation of them leads to polyacrylic acid whereas reduction gives polyallylalcohol. It is known that direct polymerization of allylalcohol only leads to low molecular weight species of polyallylalcohol and it was, therefore, of considerable interest to study the behaviour of higher DP representatives of this polymer. They are colourless substances which will dissolve easily in water and give solutions of very high viscosity.

Polyacroleins form water soluble complexes with bisulphite type components, from which the polymer can be readily precipitated by decomposition of the complex. They also undergo, upon treatment in alkaline environment, a Canizzarro reaction in the course of which the aldehyde groups are transformed in sequences of alternating hydroxyl and carboxyl groups, as shown in Fig. 1, which exhibit a very interesting binding capacity for ions and show strong inclination for the formation of lactone rings along the length of the backbone chain.

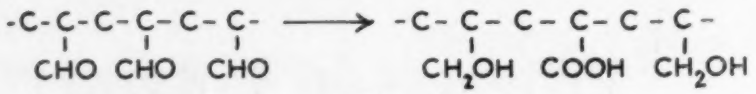


Fig. 1

The chemistry of the linear polyacroleins shows so many interesting and attractive features that its further study is now pursued in several laboratories.

Polyacetals and Polyethers

Polyformaldehyde with molecular weights above 100,000 and with end groups which are stabilized either by acetylation, benzoylation or methylation is a hard, highly crystalline polymer, which melts at about 185°C., is not soluble in any organic solvent at temperatures up to about 150°C. and shows a remarkable resistance against all chemical agents in the same temperature range. It is put on the market by the Du Pont Company under the name of Delrin and is already widely used in the field of moulded and extruded objects mainly because of its hardness, impact strength and high resistance to abrasion and chemical influences. This polymer is the practical product of an extended study of the mechanism of aldehyde polymerization with anionic catalysts which led to the result that high molecular weights can only be obtained in a strictly anhydrous system, since the proton of the coater acts as chain terminator and water itself as chain transfer agent.

Once the importance of complete dryness was recognized it became attractive to investigate the behaviour of other aldehydes under the influence of anionic catalysts in anhydrous systems. In fact, high molecular weight polyacetaldehyde can be prepared by suspension polymerization of the monomer in organic solvents with anionic initiators in the absence of water. Infra-red analysis and the fact that the material depolymerizes under the influence of acids indicates that it has the structure shown in Fig. 2, with no steric regularity of the spatial arrangement of the methyl groups along the length of the chain. As a consequence of its atactic nature polyacetaldehyde in the molecular weight range above 50,000 is a soft rubbery material with a high resilience even at low temperatures and a fair stability against chemical agents if the hemiacetatic end groups are once protected. In order to test the practical applicability of elastomers based on polyacetaldehyde there are studies under way which explore the copolymerization of the monomer with formaldehyde, acetone and acrolein. The entry of this latter monomer into the chain would provide for the presence of vinyl type double bonds which are necessary to permit these rubbers to be reinforced by carbon blacks and processed by the standard rubber curing and vulcanizing techniques.

The recognition of the importance of keeping water away during the polymerization has led to a similar development in the field of epoxide polymerization, the first result of which was a high molecular weight polythene oxide. This material is obtained from the monomer by suspension polymerization under the action of anionic catalysts and is a white, crystalline polymer which melts around 80°C. and is copiously soluble in water where it forms stable solutions of very high viscosity, which are now being studied for the application of textiles sizes and in the technology of cosmetics and detergents.

Many interesting results have emerged from the anhydrous polymerization of propylene oxide which can also be initiated with anionic catalysts but proceeds best under the influence of a complex of the monomer with $FeCl_3$. Monomeric propylene oxide has an asymmetric carbon atom (see Fig. 3), and exists, therefore, in a D- and L- form and also as a racemate. If the racemate is used the polymer is essentially atactic and is a soft rubbery material which retains its resiliency down to low temperatures and can be exposed to fairly high temperatures without deterioration or degradation. If, however, either the D- or the L-monomer is fed into the reactor the same catalysts produce hard, crystalline materials which melt around 80°C., are optically active and have a highly stereoregulated structure. The investigation of rate, molecular weight and degree of tacticity as obtained under different experimental

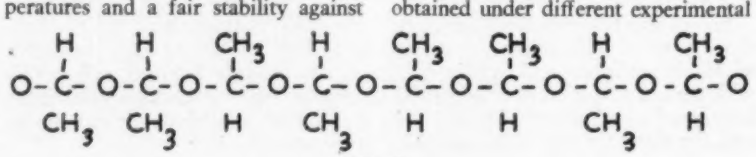
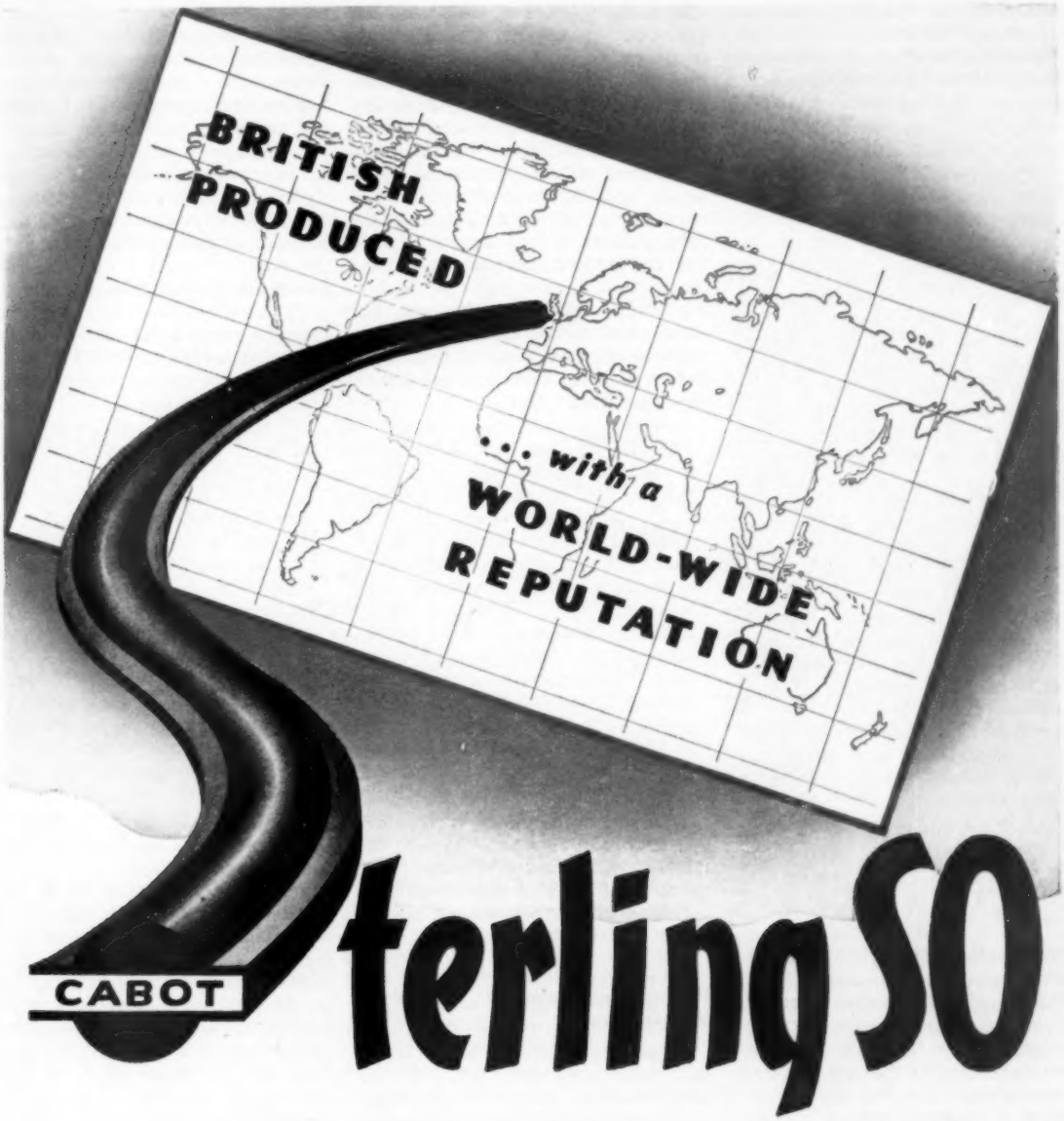


Fig. 2



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conditions has furnished very interesting information on the mechanism of stereoregulation through the precomplexing of the monomer with the heavy metal catalyst.

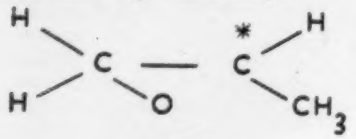


Fig. 3

The rubbery species, on the other hand, appear to be rather interesting elastomers. The range of their properties can be extended by copolymerization with ethylene oxide and butylene oxide and they can be made amenable to the standard techniques of carbon black reinforcement and sulphur cure by the incorporation of small amounts of vinylglycidylether or glycidylmethacrylate. These copolymerize through the epoxy group and introduce into the polymer molecules vinyl- and acrylic groups which can be used to built up a well-controlled three-dimensional network. The acetal- and epoxide elastomers are all based on low cost monomers, offer numerous variations through copolymerization and represent a polar type of rubbers which exhibit some compatibility with water and are very resistant against swelling in organic solvents.

Several new and promising methods for the preparation of macromolecules have recently been studied and published, a few of which are briefly described.

Polymerization Through Oxidation

It is known that aromatic hydrocarbons can be polymerized by oxidation, *viz.*, dehydrogenation. One example is the formation of polyparaxylene (Fig. 4) through pyrolysis of paraxylene. The first step, formation of a biradical, occurs at very high temperatures (around or above 800°C.) and the polymerization itself takes place during cooling of these radicals, is not easy to control and leads, in general, to high melting, insoluble, crystalline materials of difficult tractability. Other substituted aromatics have been polymerized through H_2 abstraction under the influence of peroxides or other dehydrogenating agents and linear polymers of the type shown in Fig. 5 have been prepared and described.

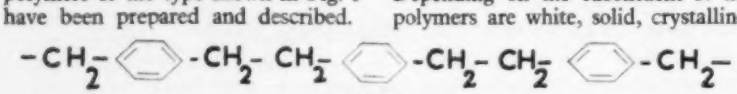


Fig. 4

Now, a simple and very attractive method for the synthesis of substituted polyphenylene ethers has been reported through the oxidation of the substituted phenols by amines in the presence of copper (I) salts as catalysts. Thus a solution of 2,6-dimethyl phenol in nitrobenzene polymerizes at room temperature in the presence of oxygen and pyridine under the influence of catalytic amounts of copper (I) chloride within an hour to form chains of the structure in Fig. 6, which have molecular weights in the range of 30,000 and are the first successful step into the domain of high DP polyphenylene ethers which can be expected to exhibit exceptional resistance to elevated temperatures, high energy radiation and chemical agents of many kinds.

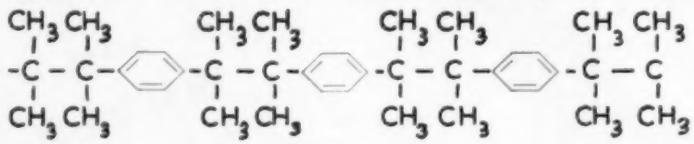


Fig. 5

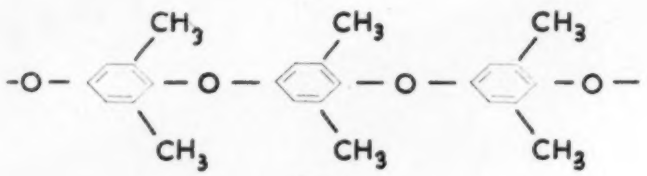


Fig. 6

Other promising steps in the same direction have been made by the synthesis of fluorinated, alkyl-substituted polyamides, triazine derivatives and highly fluorinated acrylic- and methacrylic acid esters.

Homopolymerization of Monoisocyanates

Monoisocyanates can be polymerized at low temperatures with the aid of anionic catalysts to give high molecular weight linear compounds of the general formula shown in Fig. 7, which can be classified as 1-nylons. The reaction is best carried out in solutions of the respective monomers in solvents such as hexane, toluene, dimethylformamide or methylene chloride in the temperature range between −20 and −100°C. in the presence of Na, NaCN, Na-benzophenone or Na-naphthalene as catalysts and proceeds very rapidly. Depending on the substituent R the polymers are white, solid, crystalline, materials with melting points ranging from 50 to 350°C., solubilities ranging from rather easy to very difficult and with molecular weights up to 400,000.

Clear and colourless films have been obtained from these polymers which are strong, tough, and flexible; their permeability behaviour can be varied over a wide range by the appropriate choice of the substituent, which included such representative cases as R=ethyl to octadecyl, allyl, phenyl, naphthyl, benzoyl and trimethylsilyl.

Interfacial Polycondensation

Polycondensation reactions are generally carried out in the melt or solution at temperatures which are so high that the system is permanently kept in the neighbourhood of its equilibrium — a slight increase in temperature and the removal of a small amount of water will shift the system to a higher degree of polymerization whereas the addition of some water will dissociate some of the polymer already formed. This technique is perfectly satisfactory as long as the polymer is soluble or reversibly meltable and, as a consequence, can be kept in a homogeneous liquid form for a certain length of time. For many reasons, however, one would like to penetrate into a domain of lesser solubility and higher melting characteristics. This leads to the serious difficulty of not being able to apply the classical method of equilibrium polycondensation for the preparation of such polymers.

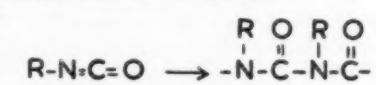


Fig. 7

Fortunately a new and very attractive method has recently been devised to synthesize linear polycondensation products very rapidly at low temperatures at the interface of two immersible liquids. This interfacial polycondensation is based on the well-known Scholten-Baumann reaction between an organic acyl-

chloride and an amine, or on similar reactions in the course of which HCL or HBr is evolved which can be bonded to a base at room temperature and, therefore, can be readily removed from the reacting system in an irreversible manner, whereby the back reaction and with it the establishment of the equilibrium is avoided. Very high molecular weight polycondensation products can be prepared with the aid of this method almost instantaneously at room temperature at the interface of two immersible liquids.

As a special example, the formation of polyhexamethylene sebacate can be carried out conveniently as follows.

An organic phase consisting of 2ml. sebacoyl chloride in 100ml. carbon tetrachloride is placed in a 200-ml. beaker. Over this is carefully poured a solution of 4.4g. hexamethylenediamine in 50ml. water. A thin film of polymer forms at once at the interface. Usually it is first somewhat irregular and contains some air bubbles. When this first film is pushed aside, new, smooth film forms at once at the fresh interface. The walls of the glass are freed of strings of polymer, the mass is grasped at the centre with tweezers and raised as a rope of continuously forming polymer film. The film always forms a tent having draping and shifting folds with the apex at the airliquid interface.

The simplest isolation method is to wash the polymer thoroughly with water and to dry it in air. The washing is greatly hastened if 50% aqueous alcohol or acetone is used for an initial wash. This treatment quickly removes the carbon tetrachloride and any unreacted acid chloride. As an alternative isolation procedure, the polymer may be dried first to remove the organic solvent and then washed well with water to remove the salts and unused reagents.

The product will have a low density and a paper-like texture which is not characteristic of the usual form of polyamides. However, fibres can be formed from the polymer in the molten state. The polymer is melted carefully on a metal spatula or spoon or in a small test tube over a hot plate or low flame; then fibres are pulled from the melt by means of a glass rod or a match stick brought into contact with the melt and withdrawn slowly. Some discoloration of the polymer may occur from exposure to the air, but this will not affect the fibre-forming demonstration unless the polymer is charred or heated for a prolonged period.

One can also prepare a film of the polymer from a solution. Many polyamides are soluble in formic acid (90 to 100%). A 10 to 20% solution of the polymer may be prepared by stirring the polymer and formic acid in a small test tube or bottle at room temperature. Heating the mixture to assist solution should be avoided, as this tends to degrade the polymer. A flexible, hazy film will form when this syrupy or viscous solution is spread on a glass plate and allowed to dry overnight in a hood.

Characterization of Polymers

Considerable progress has been made recently in the characterization of macromolecules regarding their structural details and their behaviour in dilute solution and in the solid state. Special emphasis was, of course, devoted to the characterization of stereoregulated polymers and of graft and block copolymers.

The first method applied by Natta to establish the existence of stereoregulation was the X-ray method; it is very successful if the degree of tacticity of the investigated products is so high that they can form a regular three dimensional lattice-like structure. In fact both X-ray and electron diffraction has been used to establish the presence of tacticity and is continuously used in all current attempts to extend the art of stereoregulation to vinyl and acrylic type polymers. However, according to its nature it only responds to high degrees of regularity and is not applicable to cases of low or intermediate degree of tacticity. In order to characterize systems of this type other tests have recently been explored and applied.

One group of them relies on kinetic measurements in dilute solutions of the respective polymers. An individual macromolecule suspended in a good solvent can be considered to be a random array of highly solvated segments the density of which decreases from the centre to the surface of the irregular coil according to a Gaussian function; the entire system being governed by an overall randomness of the segment arrangements in the solvent. Inside each segment, however, the arrangement of the individual monomers belonging to it (there are usually between 4 and 10 monomers in a segment) is by no means random. The exact relative positions of the carbon atoms in the backbone chain (for instance in a polypropylene) and the locations of the substituents depend on the configuration of the substituted carbon atoms which, in turn, determine the most favourable conformation of that particular segment. In general, the segments will possess a conformation which represents the best compromise between the tetrahedral character of the carbon atom valence framework, the volume requirements and the polarity of the substituents and their configurational character. Considering these local conditions it is clear that the average distances between next neighbour type groups will be different in isotactic, syndiotactic and atactic segments and, therefore, in the end effect also in the entire polymer molecules.

Any measurement carried out with such systems which depends in a characteristic manner on the influence of neighbouring groups on each other will offer a method to determine the degree of tacticity of a given material.

One effect of this type is the rate of hydrolysis of polyacrylic or polymethacrylic esters since it is well known that the rate of removal of the alcoholic residue from an ester depends in a very definite manner on its immediate surrounding, particularly on the presence of other nonionized or ionized carboxyl groups in the immediate vicity of the particular ester groups. In fact, measurements of the rate of hydrolysis of polymethacrylic esters have given interesting data on the degree of stereoregulation of the polymeric backbones even in such cases where the X-ray method has not been able to assist in the characterization of the materials. Analogous results have been obtained by the measurement of the rate of formaldehyde take up by polyvinylalcohols having different degrees of stereoregularity.

Another test which depends on the local arrangement of the substituents in the individual segments is provided by the nuclear magnetic resonance signals which some stereoregulated polymers give in dilute solutions. This method has been particularly successful in the analysis of polymethylmethacrylates, because here it is possible to prepare by the choice of adequate conditions samples of highly isotactic and highly syndiotactic character together with materials which occupy almost any intermediate position. Hence it is possible to correlate the resonance curves obtained from individual polymers to their configurational character and arrive at a calibration system which permits statements on the types and lengths of sequences which occur in a given sample.

If one focuses attention on the behaviour of the substituent at a particular monomer in the chain, it is evident that its behaviour will depend on its two neighbours. If both are of the same configuration there results the response of an isotactic

triplet which can be either lll or ddd. Such a sequence of monomers will contribute to the intensity of a nuclear magnetic resonance signal at a certain position in the spectrum or to the depth of an infra-red absorption band with a certain frequency. These signals can therefore be taken as a measure for the relative frequency of the occurrence of isotactic triplets. If both neighbours have the opposite configuration, we are facing a syndiotactic triplet which can be either dld or ldl. Sequences of thjs type will contribute to the intensity of a signal impressed on the collecting mechanism by the distances between the substituents which correspond to syndiotactic triplets. Finally, if the substituent under consideration is flanked on one side by one which has the same configuration and on the other side by one which has the opposite configuration we get a heterotactic triplet which can be materialized in four different ways, namely, dll, lld, ldd, and ddl. Each of these combinations will contribute to the intensity of a third signal which will be a measure for the relative frequency of these heterotactic triplets.

If now in the study of a given material, the three signals corresponding to isotactic, syndiotactic and heterotactic triplets appear with certain intensities one can derive from them the relative frequency of the occurrence of these placements and arrive at a fairly accurate description of the microtacticity of the sample under investigation.

Still another method which is being now studied in its effectiveness to establish the degree of stereoregulation in dilute solutions is the study of the second virial coefficient A_2 through osmotic or light scattering measurements. The present experience is that macromolecules of similar molecular weight but different degrees of tacticity show only slight differences in the value of A_2 if they are dissolved in a good solvent which solvates all their segments in a more or less perfect manner. Under such conditions it appears that the different configurations of such substituents as CH_3, C_2H_5 or C_6H_5 do not noticeably affect the conformation of the chain in its highly solvated state so that the type and degree of coiling remains substantially unaffected by the degree of tacticity of the material.

However, if one chooses a less solvating liquid and eventually approaches the Flory-point where there exists equal chance for segment-solvent versus segment-segment interactions the value of the second virial coefficient is affected by the degree of tacticity and there exists the possibility that a quantitative study of A_2 in appropriate solvent will provide a way to establish the existence of intermediate degrees of tacticity in a reproducible and reliable manner.

Another method which in certain cases allows determination of the degree of tacticity of vinyl type polymers is infra-red absorption spectroscopy, which is usually carried out with thin films of the polymer under investigation. If the spectrum of the material is not too complicated and if the different configurational triplets lead to sufficiently different absorption characteristics, the method can be successfully applied after an adequate calibration has been carried out with samples of known degrees of tacticity.

Still another test for tacticity which is carried out in the solid state is the differential thermal analysis which permits a study of exothermic or endothermic events which occur if a sample is slowly heated or cooled over a wide temperature range. The amount of heat absorbed or given off at certain temperatures reflects the existence of processes of ordering or disordering the extent of which depend on the geometric regularity of the chain segments which are involved in these processes and, as a consequence, are a measure for the degree of tacticity. Similar information can also be obtained from the measurement of the dynamic modulus and the corresponding dissipation as a function of temperature. The intimate knowledge of the relaxation spectrum of polymers with different degrees of tacticity is not only of interest for the characterization of their basic structure but reflects also in a far reaching manner their technical properties over the entire temperature range of their practical applicability.

Recently still another method has been successfully applied to establish the type and degree of stereoregulation of vinyl type polymers in dilute solution, namely their dielectric polarizability. Thus, it was found that the empirical dipolemoment of isotactic polymethylmethacrylate in benzene is 1.43 whereas the syndiotactic species in the same solvent gave $\mu=1.26$. Two atactic samples gave intermediate values, namely $\mu=1.29$ and 1.35.

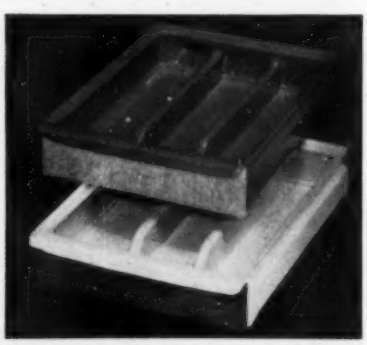
Drying of Sheet Rubber

IN 'Views and Reviews' (*RJIP* March 5 1960, 354) reference was made to a paper in the Journal of the Rubber Research Institute of Malaya, which surveyed the factors involved in the experimental study of the drying of sheet rubber. This paper indicated that much more further work was needed and that this was already under way. The publication of the results of this research is expected to occur in the near future and as a first step towards this, the RRI have just issued 'A Nomograph for the Drying of Rubber' by R. S. Gale. This publication consists of a stiff folder with a pocket containing a full size nomograph, together with comprehensive instructions for its use.

The Nomograph provides a rapid method of determining the effect of changes in relative humidity, temperature and sheet thickness on the time for drying rubber from 15% to 0.7% water content. Drying between these limits usually occupies 85-95% of the total drying time. Above 15% water content the humidity, temperature and thickness effects are different from those given in the nomograph, since a different mechanism controls the rate of drying. For drying from 15% water to values lower than 0.7% water the nomograph gives approximately correct representations of the temperature and thickness effects but gives a conservative estimate of the humidity effect.

The nomograph is based on the results of experiments carried out in the RRI laboratories under carefully controlled conditions, and applies to rubber of average water-absorbing properties.

For problems where only two variables are concerned it is sometimes convenient to extend the scale line for the third variable. Extrapolation of the *scales* on to extension lines is however not recommended.



Prototype cutlery drawer vacuum formed by the technical service department of Iridon, from their high impact polystyrene sheet. It is faced with Fablonite decorative laminate

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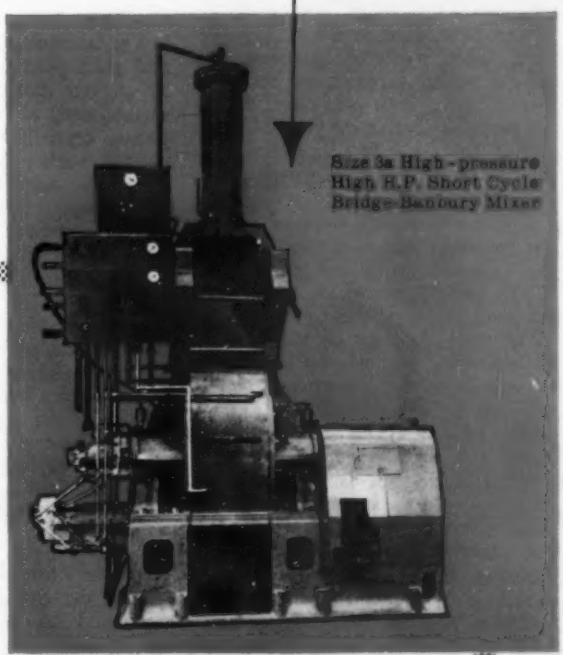

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BRPRA'S Active Year

DEMAND FOR SP RUBBER DOUBLED

DR L. BATEMAN, director of research of the British Rubber Producers' Research Association, in his introduction to the twenty-second annual report refers to the overall supply and demand position for general purpose elastomers. World consumption for these elastomers, he says, is increasing at a rate of well over 100,000 tons per annum, which is far in excess of the increase in natural rubber production. Although the difference can be, and has to be, met by greater supplies of synthetic rubbers, the superior balance of properties which still distinguishes nature's product makes it often the preferred, sometimes the essential rubber over wide fields of application. The resulting pressure on natural rubber supplies has been reflected in the high price level which has prevailed during the year. Natural rubber has, in effect, assumed the position of the premium general purpose elastomer.

Awareness of this state of affairs has naturally influenced the Association's research policy and programme. While natural rubber occupies this premium position, every effort needs to be made to improve still further its processing and properties so that on this score the extra cost can be justified, to seek economy in use by compounding advantageously with fillers and with cheaper synthetic rubbers and other materials, and to encourage its use in those applications where quality in the final product counts for so much. In addition, increased supplies with greater efficiency in production are obviously desirable, and long-range fundamental research to this end is in progress to reinforce the various lines of work being carried out at the Rubber Research Institute of Malaya with the same purpose.

Greenhouse Flourishing

The tropical greenhouse is now well established, and the rubber trees, under conditions fairly close to those extant in Malaya, are growing well. Installation of an electron microscope has enabled an investigation into the ultra-fine structure of fresh latex and latex vessels to be started and early results of this work have been interesting. Apart from this work in the biological field, a line of physical investigation has been undertaken, and several problems have been successfully approached. It has been possible to study phase separation in rubber-polymethyl methacrylate interpolymers and other two-polymer systems by replica methods. Similar techniques are yielding new and valuable information about ozone attack on rubber both in the strained and unstrained state. It has also been possible, with the aid of a special specimen cooling device, to induce thermal crystallization in thin films of natural rubber in the microscope. At least two modes of crystallization have been observed and their dependence upon the temperature is being studied.

Cis-Trans Isomerization

The isomerization of natural rubber and gutta-percha by thiol acids and by sulphur dioxide has been further investigated, and a method of preparing crystallization-inhibited natural rubber has been developed which is suitable for commercial application. Sulphur dioxide is replaced by the solid reagent, butadiene sulphone, which quantitatively liberates sulphur dioxide when heated above 130°C. The procedure is therefore to mix the sulphone (1-2%) with natural rubber on a mill or in an internal mixer, and then heat this mixture for a few minutes at 170°C. in a gas-tight apparatus. The latter part of the process is most conveniently carried out either in an enclosed mixer, such as the Baker Perkins Universal Masticator, or in an extruder.

Superior Processing Rubber

The demand for SP rubber has continued to develop satisfactorily and during 1959, the second year of commercial production, shipments were double those of the previous year and totalled 2,320 tons.

To assist in the wider application of this development a form of concentrated SP rubber, known as PA.80, has been developed in collaboration with the Rubber Research Institute of Malaya. This is readily compatible with all grades of natural rubber and some types of styrene-butadiene rubbers, and when added to ordinary rubber in small proportion provides a processing advantage similar to that obtained with SP rubber. PA.80 replaces the less readily dispersible SP.90 mentioned last year and greatly extends the scope for SP rubbers for the reasons:

(i) The processing benefits obtained with the regular grades of SP rubber may now be imparted to any grade or mixture of grades of natural rubber.
(ii) The degree of processing improvement can be varied at will to suit special applications.
(iii) The processing improvements obtained by the use of PA.80 with SBR follow the broad pattern set by natural rubber; marked advantage is shown over cross-linked types of SBR, resulting in greater smoothness and dimensional control of extruded and calendered articles and improved physical properties in non-black compounds.

A major advantage of both regular SP rubber and PA.80 is the considerably increased throughput of both non-black and black loaded compounds. This important practical point has been confirmed on larger scale equipment at Rubber Technical Developments.

Ozone Cracking of Rubber

Significant discoveries in the study of the cracking of rubber exposed to ozone are that cracks develop at any point where the local stresses exceed a well-defined, critical value, and that, if this value is exceeded, the crack proceeds at a characteristic rate. The role of the most effective antiozonants is to increase this critical stress, but once the enhanced critical stress is exceeded the crack grows almost as fast as in an unprotected rubber. This means that if insufficient antiozonant is used for the maximum stresses encountered in service the antiozonant has no beneficial effect, and, due to the reduced number of cracks occurring, its effect may well be harmful.

If the enhanced critical stress is exceeded, so that a crack is initiated, the crack will continue to grow at a very much lower stress. Moreover relatively low values of critical stresses are obtained if a freshly cut surface is exposed immediately to ozone and thus it appears that an 'aged' surface has specific properties responsible for protection. The extent of the increase in the critical stress produced by antiozonants depends upon both the ozone and antiozonant concentration. An antiozonant which considerably increases the critical stress at low ozone concentrations may be virtually ineffective at high ozone concentrations.

These results, which are of great importance in the development of an understanding of the mechanism of protection of rubber produced by

Continued on page 211

Bekum Blow Moulding Equipment

NOW AVAILABLE IN UK

THE range of Bekum blow moulding equipment, which is manufactured in Western Germany and Switzerland, is now being sold in the UK by Edlon Machinery Ltd., 30 Little Russell Street, W.C.1, who have been appointed sole agents.

Bekum are already well known in Germany as manufacturers of plastics containers and objects. Until 1957 they built extruders and blow moulding equipment only for their own use, but then they enlarged their engineering shop and started to build machines for general sale without licence arrangements. Eleven different models are available.

Bekum single heap model. Type E.38/BA/110/2

The blow moulding sections can be operated either pneumatically or oil-hydraulically. One of the features of the machine is that the standard blowing equipment, by adjustment of a single switch, can be used for two distinctive methods of blowing: neck calibrating and the hollow needle system.

It is claimed that by the first method perfectly calibrated and seep-proof necks are formed suitable even if the simplest closure system is used. No milling or cleaning-up of neck is needed after blowing. Using the second method, either toys, goods for display advertising, lamp shades or very small containers in groups of 2, 4 or 6 — depending on total length — can be produced.

The equipment can be equipped with either 1, 2 or 4 blowing and extruding heads. Production speeds depend mostly on the type of material to be used, but the machine is set to work at 12 cycles a minute, so, for instance, a 12g. calibrated polythene bottle can be produced on a two-headed machine at an output of approximately 960 bottles per hour.

The extruder, which is fitted with a special nitrided screw, can be used for various materials including cellulose acetate, PVC and nylon, in addition to the other known types of plastics materials. The diameter of the screw depends on the size of the extruder and blowing equipment. The Bekum does not extrude the tube around the mandrel. The forming dies of the blowing equipment come forward and grip the tube, which is then cut off from the extruder head, and bring it forward to a position where the mandrel enters the tube from above. Special design of the flaming mandrel is said to ensure a well-formed clean neck after cooling and ejection.

Geigy Remove

The Geigy Company Ltd., of Rhodes, Middleton, Manchester, has acquired, subject to contract, the offices and laboratories of the British Rayon Research Association at Heald Green, Manchester.

The Geigy Company is a member of the group which in Britain, under Geigy (Holdings) Ltd., also includes the Geigy Pharmaceutical Company Ltd., of Wythenshawe, Ashburton Chemical Works Ltd., of Trafford Park, and James Anderson and Co. (Colours) Ltd., of Paisley. The group is an associate of J. R. Geigy S.A., of Basle, which has been continuously active in the chemical industry since 1758. The intention is to transfer the offices of Geigy (Holdings) Ltd., and the essential headquarters of the Geigy Company's sales, administration and laboratory activities from Rhodes to Heald Green some time during 1961.

A Symposium on ' Stereochemistry in Organic Reactions ' will be held at the University of Alberta in Edmonton, September 6 and 7 1960, by the Organic Chemistry Division of The Chemical Institute of Canada.

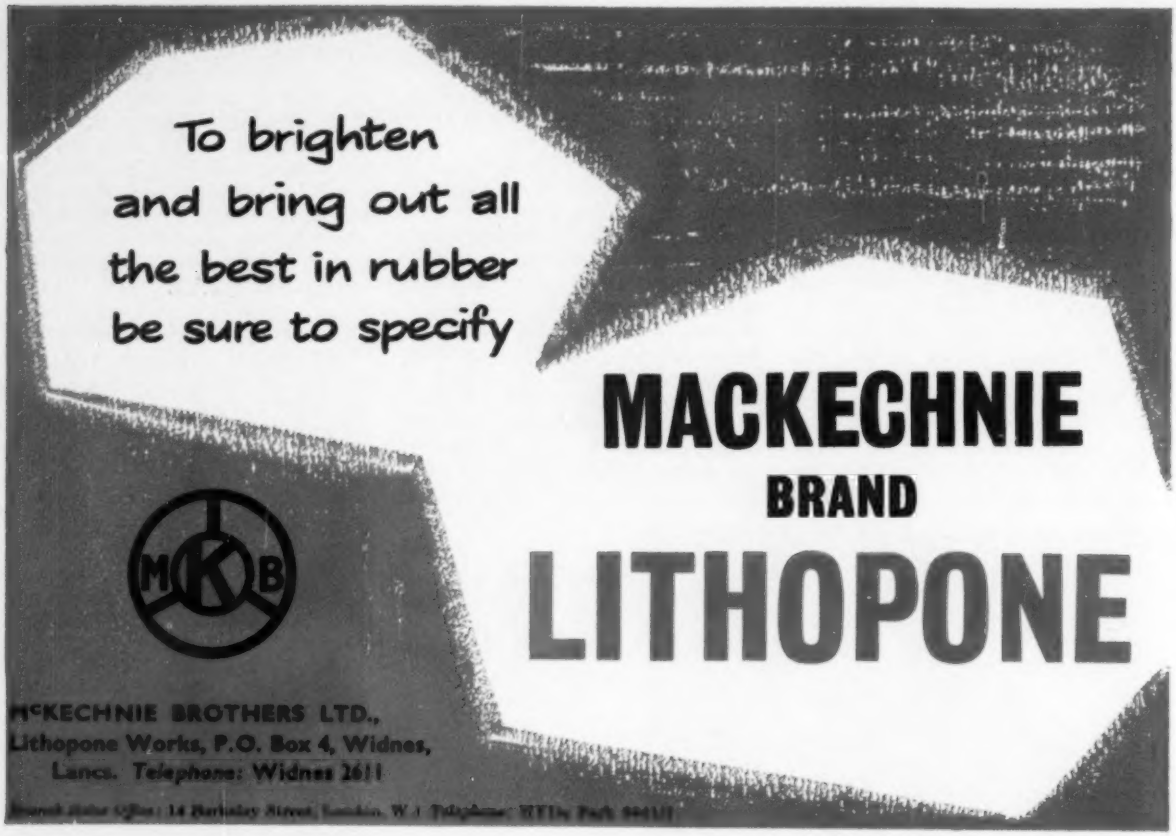
Plastics on Fire

There are at present more than 2,000 proprietary plastics and the number is growing daily. *Plastics*, a new Technical Information Sheet (No. 3014) published by the Fire Protection Association, makes a chemical classification of plastics and deals with the fire properties of the various groups.

Thermosetting plastics are as a rule difficult to ignite, but the fire properties of thermoplastic materials differ widely and relate to a number of factors apart from the chemical composition of the plastics. These factors are mainly: the form of the plastic—*i.e.* whether in bulk mouldings, sheet, film, fibre, liquid or powder; the degree of free access to the air; and the support given to the combustion of the burning material by others burning nearby. Since the majority of plastics are organic, their dusts are nearly all capable of forming explosive mixtures with air. The lower explosive limits of these dusts and their ignition temperatures, where known, are given in the Information Sheet together with the ignition properites of the plastics and descriptive accounts of their appearances and odours when burning.

Copies of the Technical Information Sheet may be obtained free of charge on application to the Fire Protection Association, 31/45 Gresham Street, London, E.C.2.

Courtaulds is installing additional plant to increase the production capacity of Courtolon bulked nylon yarns from September to meet rising sales.



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Resin Rubber Steps in Front

INCREASING USE OF SYNTHETIC BY FOOTWEAR INDUSTRY

RUBBER has been steadily replacing leather as material for footwear soles. Of all British-made footwear in 1959, over 60% with uppers wholly or mainly of leather had non-leather soles and it is estimated that this will rise to about 80% of the total by 1965. And resin rubber accounts for something like 40% of all soling materials in this country.

The British footwear industry — which uses 25,000 tons of rubber a year, or 10% of UK consumption — has encouraged the rapid growth and acceptance of resin rubber to the stage where it is no longer considered an alternative material, but is accepted in its own right.

A brochure has just been published, which gives a brief background history of the industry and the revolutionary advances made in adopting new methods of manufacture and distribution, and in the use of new materials.

The brochure is the first of a series to be issued by the International Synthetic Rubber Company designed to show the increasing use of Intol rubbers in industrial and consumer applications.

Among the reasons given by ISR for the success of resin rubbers in this field are: they have uniformity, which means that the manufacturer can have complete control over all stages of production; cut to waste is reduced to a minimum; they are easy to work, flexible and waterproof. Wear tests are reported to have shown that resin rubber soling, either solid, semi-expanded or micro-cellular, is harder wearing than any other soling material. Mixed-in pigments mean a permanent colour, which can be finely matched or contrasted with the upper.

The use of a low Mooney SBR — such as Intol 1509 — is rapidly increasing because of speedy processing and also the reduced power consumption needed to obtain the low Mooney plasticity required, particularly for sponge applications.

The moulded-on-sole process—in which the rubber compound is applied to the upper and then vulcanized—is now being increasingly applied to lighter, more fashionable shoes, as well as to the more standardized types, such as children's shoes and agricultural boots.

In conventional rubber footwear—rubber boots and overshoes — both natural and SBR are used, except in industrial applications where oil-resistance means employing nitrile rubbers or mixes with SBR or butyl rubber. Some boots are latex dipped, giving a seamless product; recently Wellingtons have been produced by direct moulding.

The ISR booklet gives details of their range of rubbers for shoemaking, together with recommendations on processing and specimen formulation costs. A typical formulation quoted, for a direct vulcanization stock is:

Intol 1502	50
Intol 1778	50
Polygard	1.5
Pepton 22	1
Fortafil A70	60
China Clay	45
Pale Coumarone Resin	10
Zinc Oxide	5
Stearic Acid	2
Diethylene Glycol	2
D.O.T.G.	0.75
M.B.T.	2
T.M.T.	0.75
Titanium Dioxide	3
Winnofil S	15
Paraffin Wax	1.5
Nonox EXN	1
Sulphur	2.25

Mastication and the addition of 2.5phr of polythene is recommended in this case to assist mould flow.

Properties of this stock are given as:

S.G.	1.42
ML_4	78
MS_{10} 100°C. mins.	13.5
MS_{10} 120°C. mins.	3.25
Tension strength psi	1760
EB %	570
M_{300} lb/sq. in.	585
Hardness IRHD	78
Comp/Set % 24 hrs. at RT. constant stress	9.5
Extension set %	4.5
Resilience %	45
Tear psi	575
Du Pont Abrasion Loss cc/hr.	15
Optimum cure mins. at 292°F.	5

In the ISR publication 'Intol in Footwear' chapters are called steps — and this is how they are paced out

Formulations such as this are examined and discussed from a shop floor viewpoint. The booklet, which is excellently, even dramatically, produced, can be obtained from the International Synthetic Rubber Co. at Hythe, Southampton. Further booklets in this series are still in the embryonic stage, but it is understood that other subjects covered will probably include the cable industry, sporting goods and upholstery and carpets.

Cyanamid Plant Extensions

Extra staff for Cyanamid's Lederle Laboratories and Melamine plant at Gosport, Hampshire, are now being recruited to man newly-built extensions which would be coming on stream within months. The managing director of Cyanamid of Great Britain Ltd., Mr O. N. Williams, announced last November plans to build a melamine plant at Gosport.

Towering above Brig. Gen. Chester V. Clifton, 6-ft. deputy chief of information for the US Army, is this tyre—said to be the world's largest. More than 10 ft. high and 4ft. wide, it is built by Firestone Tire for the US Army's new giant overland cargo carrier, a section of which appears in the background. Each tyre requires only 10lb. of inflation pressure when the carrier is fully loaded

What makes the accountant affable?

It's when an item of plant has repaid its capital cost and starts to show a profit that the men of figures start to thaw. Concerns using solvents in their processes should boast a high rate of accountant affability. For a relatively modest outlay a Sutcliffe Speakman unit will recover and return for repeated re-use solvents which would otherwise waste by evaporation. Capacities range from one gallon to hundreds of gallons per hour. Savings may be a few pounds every week or thousands every year.

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MEN *and* MATTERS

A Review of People and Events

by Peter Richards

PAUL WORTH, director of Dunlop advisory services, who, a few years ago, was closely concerned with the establishment of a tyre factory in Russia, has retired. Born in Brooklyn, New York, in 1892, Mr Worth (who is still an American citizen), spent a short period in the development department of Goodyear before he joined the India Tire and Rubber Co. in 1920. He worked on tyre development there, and as chief engineer. In 1927 he was given the job of finding a suitable site in Scotland and establishing an India Tyre factory. The ex-balloon factory at Inchinnan — where the R.34 was built — was chosen and production commenced in July 1928.

As works manager and later as works director, Paul Worth saw the acquisition of the India Company by Dunlop in 1936. During the last war, his factory was responsible for producing about 21% of the aircraft tyres used by the RAF.

In 1957 he retired from the India Co. and, joining Dunlop Advisory Services, became a member of the British team who gave the Russians valuable assistance in developing the tyre factory at Dneipropetrovsk, near the Dneiper River.

Du Pont in Geneva

Dr Russell A. Kurtz has been appointed marketing manager for neoprene synthetic rubber and other Du Pont synthetic rubber products, according to an announcement in Geneva by William D. Eaton, managing director of Du Pont de Nemours International S.A.

Dr Kurtz, previously manager of Du Pont's Chicago sales district for the parent company's Elastomer Chemicals Department, will be responsible for directing elastomer sales activity in Europe, Africa and Australasia. Since joining Du Pont Dr Kurtz has had 18 years' experience in research and sales. He received a Ph.D. degree in organic chemistry from the University of Notre Dame, South Bend, Indiana, in 1942. He is a member of the American Chemical Society and has been a director of the Society's Division of Rubber Chemistry.

Adventure Boots

One of the pairs of boots worn by Britain's 'walking sergeants' on their 3,000-mile record-breaking walk from San Francisco to New York has become the first trophy in an 'adventure cupboard' at a school for spastic children.

One of the two walkers, Flt.-Sgt. Patrick Moloney, presented the boots to the 49 boys and girls at the Craig-y-Parc residential school, near Cardiff.

Sgt. Moloney read to the children a message from Sir Charles Colston, one of whose companies — ITS Rubber Ltd. — provided the organization and most of the financial assistance for the walk, as well as the Commando soles and heels which the sergeants used.

Plastics in Project Mercury

The problem of re-entering the earth's atmosphere from space 'in one piece' without burning up appears to have been solved. American plans to put a man into space envisage attempts early next year, when one of the seven astronauts now in training will circle the earth about 120 miles up. The vehicle in which the attempt will be made is a Mercury capsule, carried on an Atlas missile, the whole plan being known as Project Mercury. In preparation for the first manned attempts, the Americans plan to launch three Mercury capsules before the end of this year, and to bring them back intact. The runs will be unmanned but probably not 'unanimalled.'

Because of their particular properties and their light weight, plastics materials figure prominently in the equipment of the one-ton capsule. According to the current, Summer, issue of C.S. Chemicals, the 8in. diameter lenses for the periscope through which the astronaut will be able to view space are made from Columbia Southern's CR-39 material. This is a clear thermosetting plastic, polymerized allyl diglycol carbonate, with excellent optical, physical, and chemical properties. The lenses, made by the Polycast Corporation, Stamford, Conn., weigh only half as much as equivalent lenses made of glass. This results in a saving of several pounds which in turn saves many hundreds of pounds of fuel used in firing the rocket. Incidentally, it is really rather astonishing to realize that when an astronaut finally makes the first trip, he will be in space for a few hours only: could in fact make three trips round the earth between lunch and dinner. And it takes me almost that amount of time to get to work.

European Manager

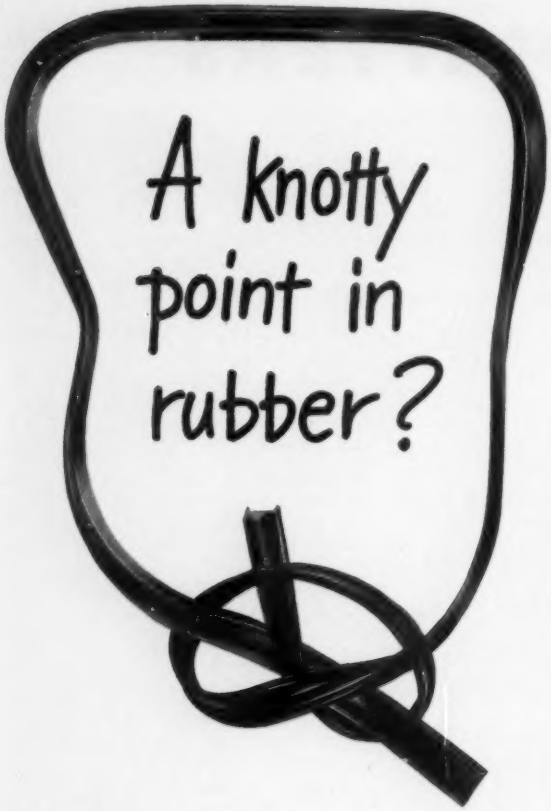
Columbian Continental Europa, S.p.A., has announced the appointment of E. H. Baker as general manager. The company, owned jointly by Columbian Carbon Company, New York, and Continental Carbon Company, Houston, Texas, is presently constructing production facilities at Trecate, near Milan. A native of Indianapolis, Indiana, Mr Baker worked at various technical jobs in the Akron area, and joined Binney and Smith Inc., then Columbian's sale agent, in 1929. He served as the first manager of their Akron office, and spent twenty-five years in this position.

While in Akron, he was a charter member of the Akron rubber group and its chairman in 1936.

Mood Laminates

When the *Windsor Castle* — which will be the largest liner ever to trade regularly with the South African ports —begins her maiden voyage on August 18, she will contain no less than 200,000 sq. ft. of Formica decorative laminate.

The laminate has been used in special artwork, as well as standard patterns, and Formica Ltd. indicate that the designers have used the material to fit in with a variety of



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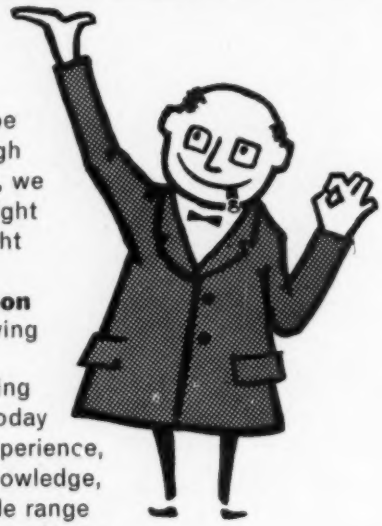

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moods. For instance, the vivacious atmosphere of a verandah café is achieved by a special design of birds and butterflies, which is echoed in the curtains and upholstery. But sometimes the fitting of laminate to mood seems a little too subtle — what I wonder, is the significance of using 'Australian Walnut' for officers' furniture and 'Bleached Mahogany' for the crew's?

Angus Award

The George Angus group has started the excellent idea of awarding a yearly travel scholarship. This scholarship will 'enable a young man or woman of ability and character in the employment of the group to travel overseas for study, training and general education.' It has been instituted to mark the services of the chairman of the group, Colonel E. Graham Angus, as managing director for 25 years.

The honour of being first to win the award has gone to 28-year-old Kenneth Irving, a research chemist in the company's oil seal division at Wallsend.

Mr Irving will visit America and Canada to study production methods and research in plastics and synthetic rubbers. He starts his travels in September and will spend about four months visiting industrial centres in each country.

Buyers' Talk

C. G. Addingley, chief chemist of British Belting and Asbestos, will speak on the potentialities of plastics at the 1960 Scarborough Conference of Purchasing Officers, September 29—October 1.

D. J. Flunder (general purchasing manager, Dunlop) and L. G. Wilson (purchasing manager, British Insulated Callender's Cables Ltd.) will be members of a panel discussing imports. The conference will be opened by Sir Edward Boyle, M.P., Financial Secretary to the Treasury.

Promoting Petrothene

Raul F. Colbert has been appointed export sales representative for US Industrial Chemicals Co. He will be initially concerned with export sales promotion and technical service for Petrothene polythene resins.

Mr Colbert served for three years as sales engineering co-ordinator with Calofrig S.A., an Argentine producer of insulating materials. Following this, he was associated with the Argentine Chamber of the Plastics Industry as a technical editor of the trade publication 'Plasticos.'

* * *

Marcy W. Osborne, Jun., has been named general manager of B. F. Goodrich–C.S.R. Chemicals Pty. Ltd., recently established in Australia by B. F. Goodrich and C.S.R. Chemicals Pty. Ltd. of Sydney. The new firm will manufacture vinyl plastic materials in a plant now under construction at Altona near Melbourne.

* * *

Mr John B. Henderson has joined Fablon Ltd., 49 Park Lane, London, W.1, as product manager of the Building Division. Mr Henderson was previously with the Publicity and Promotion Department of Beaverbrook Newspapers (Scotland) Ltd.

K. H. Johnston, manager of the general products division of Goodyear (G.B.) Ltd., who has been elected a member of the executive committee of the Federation of British Rubber and Allied Manufacturers

William R. Blake has been elected managing director of B. F. Goodrich's subsidiary Industria Colombiana de Llantas, S.A., in Bogota, Colombia. He has been general manager of International B. F. Goodrich operations in Puerto Rico since 1956.

* * *

8,400 sq. yd. of 300-gauge Fablon polythene film is being used as an underlay to prevent moisture loss in the construction of Gatwick airport's new maintenance taxi-way.

Question Corner — 129

(Second Series)

454. What advantages are there in the flat film extrusion of polythene?

(Answer next week)

Answer to Question Corner — 128

453. The film draw-down rate is defined as the maximum haul-off rate, without breaking, of a film being extruded through a given die opening at constant temperature and output.

It is a measure of the resistance to tearing of the viscous film, and a practical measure of the hot-melt viscosity of the resin. The higher the melt index, the greater the draw-down rate, other things being equal.

For relatively easy extrusion a high drawdown rate is desirable. Polythene resins for flat film extrusion must have a melt strength which will permit drawing from the die at high speeds —say 200ft./min.

When blowing films the speeds are lower, as are the resin temperatures; draw-down strength is correspondingly reduced but, nevertheless, draw-down strength is as important in blown as in flat film extrusion.

In paper coating the draw-down strength must be exceptionally good because of the high haul-off rates required.

Medium density resins are recommended for film extrusion, as they have higher draw-down rates than those of low density. This will permit production of a given gauge film with a higher density resin of lower melt index, provided the draw-down rate of that resin is adequate. Other advantages are that the stiffness is better, and so is the transparency, tear strength and resistance to blocking.

(Another question next week)

Polly Ester Says . . .

'Thinners—people who don't go to church'

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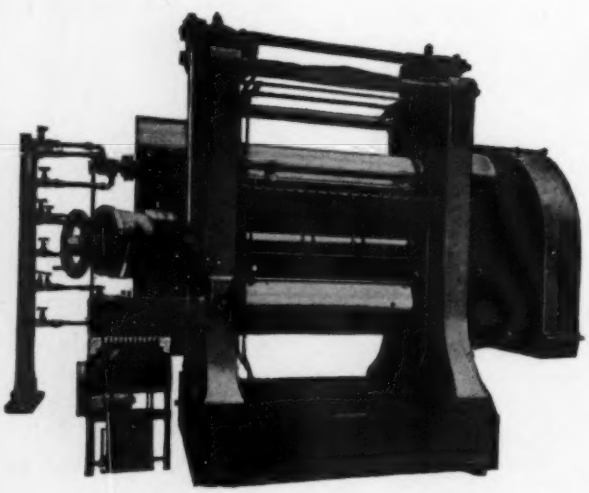


24" dia. x 68" face 3-ROLL EVEN and FRICTION SPEED RUBBER CALENDER, with Patent Nip Feed Guard, Circular Lubricating System from individually driven 12-point Forced Feed Lubricator with Self Filling Pumps. Mechanically Operated Elevating Unit for top and bottom Rolls. Variable Speed Drive to suit any requirement.

Captain's Prize

IRI MANCHESTER GOLF

THE Manchester section of the Institution of the Rubber Industry's Golfing Society held the captain's prize competition at Romiley Golf Course. The captain, S. Heywood, welcomed forty members of the section. Despite bad weather in the morning the afternoon cleared and the conditions became ideal.

The competition for the main prize was won by Eric Cheetham, with a nett score of 72. The second prize was won by A. Lord (74). Several members tied on 75 and 76, and leading scores are given below:

E. Cheetham	85—13—72
A. Lord	94—20—74
E. Ball	95—20—75
S. Clark	93—18—75
E. Morris	92—17—75
H. West	89—13—76
T. E. Waring	89—13—76
G. C. Swann	94—18—76
J. L. Ferguson	87—10—77
B. J. Haill	94—16—78
A. F. Sanders	96—18—78
L. R. Allaby	87— 7—80
H. G. Redfern	92—12—80
J. L. Dexter	98—18—80
H. K. Mills	86— 6—80

In an after dinner speech the captain welcomed the president of the society, R. N. Ferguson, the president of the Romiley golf club and the captain of the club.

In addition to the main prize, the captain presented a further thirteen prizes in the order of the best scores. They were donated by: S. Heywood (Alfred Smith Ltd.); T. A. Wilson (BRR); F. M. Read (BRR); A. W. Kenyon (W. Kenyon and Sons Ltd.); D. J. Haill (Dunlop); D. Punton (Durham Raw Materials Ltd.); A. F. Sanders (Rubber Regenerating); A. W. Hyres (British Titan Ltd.); T. R. Waring (I.C.I.); H. W. West (West and Senior Ltd.); S. Horrobin (Anchor); W. Valentine (Metals and Alloys Ltd.); and C. T. Manson (Alfred Smith Ltd.).—G. C. S.

Hinged Foam

An American shipping container includes a cored bottom and a fitted hinged top, both being cut from a single cube of Allied Chemical black polyurethane foam. No assembly is required.

The hinged top is formed by slicing through the block of foam to within ½in. of the end. The bottom of the container is then cored to accommodate a delicate electronic part, leaving thick walls to serve as a cushion and to absorb impact.

Amalgamated Bruas Offer

The directors of Amalgamated Bruas Rubber Estates state that as a result of inquiries further offers for the company's estates have been received, the best of which is one for £542,500, representing just over 13s. a 2s. stock unit. A conditional agreement for the sale of the estates at this price has been entered into and a 10% deposit has been received.

Cabot Blacks Reduced

Cabot Carbon Ltd. announce that the following reduced prices apply as from July 27. All prices quoted are per lb. ex works Stanlow in minimum 3 ton lots, smaller quantities ¼d. per lb. extra. Vulcan 3 HAF 7¾d., Vulcan 6 ISAF 9¼d., Sterling SO FEF 7d., Sterling V GPF 6¼d., Regal 300 7¾d., Regal 600 9¾d.

The telephone number of Walker, Crosweller and Co. Ltd., Whaddon Works, Cheltenham, Glos., is now Cheltenham 56366.

PIGS at Wentworth

At the Plastics Industry Golfing Society's Wentworth meeting, held on July 28, the 'British Plastics' Trophy was won by J. M. Davie (69) with W. E. H. Jones (72) runner-up.

The 'Tom Fassett Memorial' prize was also won by J. M. Davie (69).

J. M. Davie and J. N. Smith (39—22 last 9) won the 'British Xylonite' Trophy; runners-up were R. F. Saunders and R. Wood (39—20 last 9).

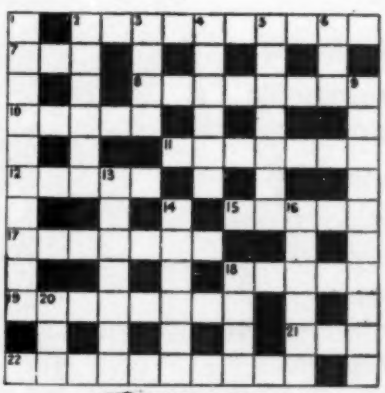
United Carbon Newcomer

A new uniform line of Baytown black masterbatch which is claimed to give increased tread wear ratings and faster processing has been announced by the United Carbon Co., whose UK agents are Anchor Chemical. A 50,000,000lb. per year production capacity increase has also been announced.

A full scale pilot plant model of the new process has been under test for the past year and commercial plant runs have been made for the past three months. Currently full-scale commercial production is under way on Baytown 8675, 8677 and 8775.

Mr A. M. Stamp and Mr I. P. McEwan have been appointed directors of the De La Rue Company.

RJIP CROSSWORD



CROSSWORD No. 73

CLUES ACROSS

2. This is used against putrefaction with a caper outside (10).
7. Feel bad? Beer, by the sound of it (3).
8. Rubber is treated thus on the mill (8).
10. Draw from a master (5).
11. Cats have them (7).
12. A proclamation with the CID back inside (5).
15. Salt and water (5).
17. Lean (7).
18. Today's society eats in them (5).
19. That's the stuff (8).
21. Small South American city (3).
22. See 1 down.

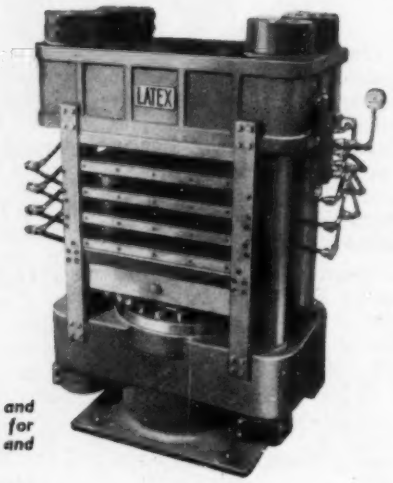
CLUES DOWN

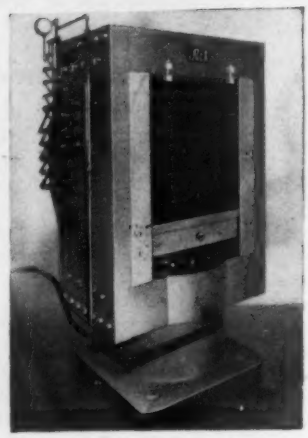
1. and 22 across. Guayule (10, 10).
2. This method is used in reclaiming (6).
3. Rubber solution is used to make this adhesive (4).
4. A capital girl (6).
5. A type working with type (7).
6. Hard water! (3).
9. Latex, for example. Sin is roped again (10).
13. A place of learning (7).
14. Let's in again to sign on (6).
16. In a tree a number shows its old age (6).
18. You stupid fool, blood forms this (4).
20. Another IRA is all around us (3).

(Solution appears on page 219)

Latex Engineering Co

4-Column Press
1,000 tons





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P. B. Cow Negotiations Concluded

Negotiations for P. B. Cow's acquisition of St. Helen's Cable and Rubber from British Insulated Callender's Cables Ltd., have now been completed (*RJIP* May 7, 692). In a note to stockholders, the acquisition is detailed as: a freehold factory at Slough, and, next to it, a leasehold factory on the Slough Trading Estate; rubber manufacturing plant, and the goodwill of St. Helens and the tank lining business carried out by that company.

The statement adds that this transaction will further the company's policy of expansion, and will make considerable space available for necessary increased production, and the co-ordination of the sales department with warehouse accommodation.

Payment has been made in shares and cash. 300,000 of P. B. Cow's 4s. ordinary stock units at 8s. 1d. each have been issued to BICC, together with approximately £90,000 in cash.

Philblack Prices Cut

R. W. Greeff and Co. Ltd., agents for Philblack Ltd., announce that reduced prices for Philblacks 'A,' 'O,' and 'I,' are effective for deliveries from works or store, on and after July 27. The new prices are as follows: For minimum 3-ton lots, ex works Avonmouth, Philblack 'A' 7d., 'O' 7¾d., 'I' 9¾d. For lots of less than 3 tons, 'A' 7¾d., 'O' 8d., 'I' 10d. Ex store London, Glasgow, Elton and Bury 'A' 8d., 'O' 8¾d., 'I' 10¾d. All prices per lb. nett.

Elpitiya Rubber Estates proposes to form a holding company. Holders of the estates company will receive shares in the holding company exactly similar to their present holdings.

PLASTICS EDUCATION

New scholarships have been awarded for 1960-61 from the Plastics Industry Education Fund.

They are, at Borough Polytechnic: one two-year scholarship for the DPI (£100 pa, plus fees), and one four-year sandwich course for diploma in technology (£175 pa, plus fees).

At Birmingham College of Technology: three four-year sandwich course for diploma in technology (£150 pa each, plus fees).

At Brunel: one four-year sandwich course for diploma in technology (£150 pa), and at the National College of Rubber Technology: one three-year API course (£300 pa).

A grant of £550 has been made from the Associated Iliffe Press Fund to the Borough Polytechnic for the employment of a technician to assist R. G. W. Pye, A.M.I.Mech.E., for one year in research in polymer engineering. From the same fund £450 will be applied in a one year post-graduate scholarship from the API at Brunel. £750 has been allocated for Training Grants for those already in the plastics industry who wish to follow full-time courses in chemistry, physics or engineering at universities or technical colleges.

BRPRA'S ACTIVE YEAR

Continued from page 200

antiozonants, also have an immediate practical value. It is evident that methods of evaluating antiozonants for service must not only take into account the likely stresses to be encountered, but also the ozone concentration. Further, antiozonants will be much less effective if the surface of the rubber is subject to any abrasive, cutting, or cracking process during exposure.

Instrumental Methods of Analysis

A new section with the above designation has been formed; at present it comprises ultra-violet and infra-red spectroscopy, gas-liquid chromatography, polarography, and polymer characterization.

An analytical gas-liquid chromatography apparatus comprising five columns and using flame ionization detection has been constructed. Many problems can be rapidly and conveniently tackled by this technique and its extensive use is the most significant development during the year. Problems being investigated at the present time include the isomerization of olefins by sulphur dioxide, the characterization of the sulphur compounds produced by the treatment of simple olefins with vulcanization recipes, and the reaction between ozone and hydroperoxides.

Neoprene Afloat

The *Leonardo da Vinci*, new 33,000 ton Italian liner has decking of Du Pont's neoprene synthetic rubber compound instead of wood. Apart from the complete elimination of such maintenance operations as resanding, recaulking, repairing and removal for corrosion checks, the total weight of the decking is much lower, at 28kg. per sq. m., than that for wood at about 40 to 45kg. per sq. m. The anti-skid and flame resistant properties of neoprene are added advantages and the cost of laying is less than half that of wood.

The decking was applied to a non-flammable foundation 10mm. thick made of neoprene latex stabilized by added mineral fillers. The sub-floor gives a flat surface over the seams, joints and welding beads of the metal deck plates. The neoprene decking compound was supplied by Pirelli s.p.a., Milan.

The use of neoprene decking compound instead of the traditional wood is one of the features of the magnificent *Leonardo da Vinci*, new flagship of the Italian Line which entered service last month

Rubber Statistics

UNITED STATES — MALAYA — WESTERN GERMANY

CONSUMPTION of natural in USA in June was 38,601 tons, compared with 37,608 tons in May, according to the Department of Commerce. Consumption of latex was 3,975 tons compared with 3,655 tons.

Stocks of natural rubber at the end of the month stood at 62,465 tons, compared with 67,479 tons at the end of May. End-of-June stocks of latex totalled 14,140 tons, as against 15,214 tons at the end of May.

Reclaimed rubber consumption in June was 24,677 tons, compared with 23,763 in May, and consumption of synthetic rubber amounted to 95,849 tons, compared with 91,993 tons.

Production of synthetic rubber totalled 122,547 tons in June, as against 126,804 tons in May, and synthetic rubber stocks at the end of June stood at 226,032 tons, compared with 230,332 tons at the end of May.

Malaya

Malaya produced 58,013 long tons of rubber in June compared with 56,203 tons in May, according to official figures released by the Chief Statistician.

Imports in the month totalled 5,306 tons against 5,424 in May. Exports were 59,129 tons against 62,545. Stocks at the end of June were 71,231 tons against 61,529—revised at the end of May. The latest total comprised 50,745 tons in dealers' hands, 14,916 tons on estates and 5,570 tons awaiting shipment.

Total ocean shipments during the month were 88,122 long tons, of which 50,496 were RSS1 and air dried sheet, and 9,906 latex.

This brings the total ocean shipments for the first six months of this year to 544,673 tons: a total which includes shipments of 85,035 tons to the UK; 69,822 tons to USA and 49,018 tons to Japan. West Germany has taken 48,932 tons so far this year, and France 39,277 tons.

Western Germany

Rubber consumption in West Germany during 1959 increased more than rubber goods manufacture, the Association of West German Rubber Goods Manufacturers said in a statement.

One of the main reasons was the steep increase in the demand for tyres for heavy lorries. Rubber used in manufacture during the year, at 193,097 tons, was 16.5% more than in 1958, but the production of manufactured goods, at 475,708 tons, was 14.6% higher than previously.

Exports of the companies in the Association rose by 11.9% to DM347m. during the year, while quantitatively it rose by 14.6%. The domestic turnover for tyres rose by 15.5% in value and by 18.7% by weight.

While consumption of natural rubber rose by 10.5%, that of synthetic rubber increased by 30.2%. The percentage of synthetic rubber used last year amounted to 33.9% of the total. West Germany's own production of synthetic rubber rose by 110% to 48,565 tons, but capacity now stands at 120,000 tons.

Ukarb Black Price Cut

Wilfrid Smith Ltd., in association with Hubron Rubber Chemicals, distributors of Ukarb carbon blacks, announce that the following reduced prices apply as from July 27. Ukarb 327: Minimum 3 ton lots 6¾d., 1 ton lots 7d. ex works Swansea. Smaller quantities 7¾d. ex store London and Manchester. Ukarb 340: Minimum 1 ton lots 7¾d. ex works Swansea. Smaller quantities 8¾d. ex store London and Manchester.

Lecture Series

A series of lectures has been arranged by the Plastics Institute and the City of London College, for non-technical staff working in the plastics industry. The first lecture, 'Types of Plastics,' will be delivered at the college by C. A. Redfarn on October 3.

£55,000 WORTH OF VALVES

Hunt and Mitton Ltd. of Birmingham, announce that they have received an order worth over £55,000 from Francis Shaw and Co. Ltd. of Manchester, for a supply of automatic and manual valving destined for the rubber tyre plant to be built in Rumania. The valves will control steam, high pressure, hot water, air, vacuum and cold water services to the Shaw McNeil Bag-o-matic tyre vulcanizing presses.

Metropolitan Plastics New Address

As from August 16 1960 all goods and communications to Metropolitan Plastics Ltd. should be sent to the company's new address:

Faraday Way, St. Mary Cray, Orpington, Kent. Telephone: Orpington 31631. Telegraphic address: Metroplast, Bromley.

£500 Idea

An engineering fitter has received a bonus of £500 from C. and J. Clark, the shoe manufacturers, for an idea for reinforcing plastic heels more easily. The idea is said to speed up the process four times.

Mr Frank Carr, of the Dunlop Rubber Company, has retired. He has been responsible for Dunlop's accessories sales since 1928.

Non-Rubber Elastic

Plans for the manufacture of a non - rubber elastic, made from material originating in the petrochemical industry, are announced by Lastex Yarn and Lactron Thread Ltd., which is an associated company of the Dunlop Group, and of the United States Rubber Company. This is a silicone lubricated polyester monofilament, discovered by the United States Rubber Company and marketed under the name Vyrene.

Vyrene can be spun into threads of extremely fine gauge, has remarkable resistance to the effects of sunlight, oil and perspiration, and withstands laundering and dry-cleaning. Covered with nylon and other textile fibres, it has already been successfully launched in the United States in a wide range of fine elastic fabrics for corsetry, swimwear and lingerie. Its high modulus and great tensile strength give firm figure controlling properties to fabrics that are, nevertheless, lighter and more comfortable to wear.

New Finish

Saro Products Ltd., Isle of Wight, are producing a glazed gloss/matt finish polystyrene sheet. This new finish, the result of two years' development, has been in production for six months. The sheet is claimed to give better formings, absence of surface defects, greater resistance to cracking, improved impact strength, and cheaper costs.

W. R. Grace and Co. has announced name changes for two of its eight chemical divisions. Grace Chemical Division's new name becomes Nitrogen Products Division, while Dewey and Almy Overseas Division becomes Overseas Chemical Division.

PATENT SPECIFICATIONS

The following information is prepared from published Patent Specifications by permission of the Controller of H.M. Stationery Office. The full Specifications can be obtained from the Patent Office, 25 Southampton Buildings, W.C.2, at 3s. 6d. per copy (including postage).

Production of Polymeric Materials

No. 832,700. The British Rubber Producers Research Association. Inventors: J. D. Burnett, R. J. Ceresa and W. F. Watson. Application, November 23 1956, June 14 and July 10 1957. Published, April 13 1960.

Polymer/monomer mixtures in the form of particles are compacted between solid surfaces which move relative to one another so that the particles are sheared, copolymers of the polymer and monomer being formed. The process is applicable to particles which do not form a rubbery mass at the commencement of the operation and extends the range of copolymers which can be produced by the method described in Specification No. 832,193 (*RJIP*, July 9 1960, 68). Equipment for carrying out the process as a batch operation and as a continuous operation is described. Internal rubber mixers may be used provided that the polymer/monomer particles fill the mixer and that pressure is applied to the particles by the ram or provided that the mixer rotors are spaced and shaped so as to nip the polymer particles.

Over 200 examples are given of the preparation of the copolymers. PVC was the polymer used in about a third of the examples, other polymers being polyvinylidene chloride, polymethyl methacrylate, poly-N-vinyl pyrollidone, polystyrene, SBR, chlorinated rubber, etc. The monomers used include acrylonitrile, styrene, acrylates and methacrylates, vinyl acetate, divinyl benzene and others.

Cellular Polythene

No. 837,504. The Dow Chemical Co. Application and Filed, October 8 1957. Application in USA, October 18 1956. Published, June 15 1960.

In the production of cellular polythene, solid polythene in particulate form or in the form of shaped articles is subjected to an amount of ionizing radiation corresponding to 2 to 20 megareps per sq. cm. and is then placed under pressure of a volatile organic fluid, soluble in the polythene at temperatures above its softening point. The fluid comprises tetramethylmethane, monochlorodifluoromethane, dichlorodifluoromethane, dichlorotetrafluoroethane or mixtures of these compounds. The temperature of the fluid and polythene is raised to between 100° to 200°C. and above the crystalline melting point of the polythene. When the fluid is uniformly dispersed throughout the irradiated polythene, the pressure is suddenly released to form cellular polythene composed for the most part of uniform small cells.

Crystalline Linear Polymers

No. 834,554. Montecatini Societa Generale per l'Industria Mineraria e Chimica. Application and Filed, March 7 1956. Application in Italy, March 12 and December 22 1955. Published, May 11 1960.

Linear high molecular weight polymers with substantially only a 1,4 structure are obtained from conjugated 1,3-diolefins having at least one vinyl double bond by polymerizing the diolefin in the presence of a particular type of catalyst. The catalyst is obtained by contacting a solid halide (having a valency lower than the maximum) or an oxyhalide of a transition metal of groups IVa, Va or VIa of the periodic table with an organometallic compound.

The polymerization of butadiene, isoprene and pentadiene is described in examples. The polyisoprene has the same structure as gutta percha while the vulcanized polymers have a high impact resilience.

Masticating Agents for Rubber

No. 835,391. Farbenfabriken Bayer A.G. Application and Filed, August 11 1958. Application in Germany, August 13 1957. Published, May 18 1960.

Certain metal-containing complex compounds are claimed as masticating or peptizing agents for natural and synthetic rubber. The compounds have a 16-membered macrocyclic ring system in which eight carbon atoms and eight nitrogen atoms are arranged alternately and in which each second nitrogen atom forms a heterocyclic ring with the two adjacent carbon atoms by way of two or three additional carbon or heterocyclic atoms, whereby at least one of the heterocyclic rings is substituted by an alkyl radical and/or contains, besides the nitrogen atoms referred to above, at least one further hetero atom. Examples of the compound are tetraazaporphins and hemiporphyrazines. Examples of the metals in the compounds are iron, cobalt, nickel, chromium, manganese, zinc, aluminium, vanadium or magnesium.

Shorter Abstracts

PVC Stabilizer. 831,033. Ferro Chemical Corporation. Filed, April 22 1958.—Cadmium hydroxy stearates, having the hydroxy group in the 9, 10 or 12 position, are claimed as stabilizers for PVC and other vinyl halide resins.

Irradiated Polythene. 831,257. General Electric Co. Filed, November 12 1957.—Irradiated polythene is rendered more stable to oxygen or air by heating the irradiated polythene to transform it to a less crystalline condition.

Stable Butyl Rubber Latices. 831,833. Esso Research and Engineering Co. Filed, July 15 1957.—Butyl rubber latices are stabilized by mixing with the latex, vinyl acetate and/or acrylonitrile and then subjecting the mixture to high intensity ionizing radiation.

Stabilizers for Polythene. 832,024. Western Electric Co. Inc. Filed, November 26 1957.—Polythene and other mono-olefin hydrocarbon polymers are stabilized against degradation by heat and ultraviolet light by incorporating in the polymer carbon black and a sulphur compound in which two fused aromatic ring structures are attached to a sulphur atom.

Thermoplastic Materials Repellent to Ants. 832,065. The Telegraph Construction and Maintenance Co. Ltd. Filed, May 3 1957. — Thermoplastic materials such as polythene, PVC and cellulose acetate are rendered repellent to ants and other pests by incorporating therein a fatty acid ester of pentachlorophenol in a proportion compatible with the thermoplastic material.

Bonding Tyre Cords to Polyurethane. 833,075. The General Tire and Rubber Co. Filed, July 25 1957. —Tyre cords of nylon or of polythene terephthalate are bonded to a saturated polyurethane elastomer by forming on the cords a coating of an infusible insoluble resinous condensation product of an aldehyde and a polyhydric phenol and then applying the elastomer under pressure to the cords.

Many industries use boxes for carrying or storing articles during the course of manufacture. High-density polythene is becoming increasingly used for these containers—commonly known as tote boxes. This one, in use in a confectionery firm, is made from British Resin Products' material

Rubber Markets

LONDON

The bank holiday shortened week saw rather more activity than had been expected and the market maintained a fairly steady undertone despite lack of support from the factories. Switching again featured the landed market and short-covering operations were also a factor. Increased Malayan stock figures had only a slight and temporary easing influence. The market, however, remained vulnerable to Singapore and New York influences.

Latest prices are as follows:

No. 1 RSS Spot: 30⅜d.-30⅝d.

Settlement House:
September 30⅝d.-30⅞d.
October/December 30⅜d.-30⅞d.
January/March 30⅜d.-30⅝d.
April/June 30d. nominal.
July/September 29⅜d. nominal.

No. 1 RSS cif basis ports:
August 30⅛d.-30⅜d.
September 30⅛d.-31d.
October 30⅜d.-31d.

Godown:
August 105¾ Straits cents nominal.

LATEX

Centrifuged 60% latex per gallon in drums, seller, September, October, 17s. 11d., cif European ports. Spot, seller, 18s. 7d. Bulk, nominal, d.w. 17s. 10d. August. Creamed, seller, nominal, 17s. 7d. September, October. Normal, seller, September, October, 15s.

BANGKOK

No. 1 RSS

The price of No. 1 RSS at Bangkok on August 1 was 34.75 (34.75) US cents per lb.

SINGAPORE

The market opened on a hesitant note on August 2. The tendency was to lower levels, but buyers were reluctant to operate. Near the end of the morning session sporadic shortcovering brought an improvement in prices. Prices went ahead in the afternoon, accompanied by reports of Soviet buying. Lower grades were in selective demand, but business was limited, sellers being reluctant to trade. After hours the market continued steady.

	Malayan cents per lb., fob Malayan ports to open ports	
	August 2	Prev. Close
No. 1 RSS, Aug.	106¼–106½	105½–106
Sept.	107 –107½	106½–106¾
No. 2 RSS, Aug.	105⅝–106½	105 –105¾
No. 3 RSS, Aug.	104⅞–105½	104½–105
No. 4 RSS, Aug.	103½–104½	103 –104
No. 5 RSS, Aug.	100¼–101½	99 –100½
No. 1 Spot ..	106 –106½	105½–106
No. 3 blanket thick remilled crepe, Aug. ..	99½–100½	99 –100
No. 1 fine pale crepe, Aug. ..	115½–117½	114½–116
2x thin brown crepe, Aug. ..	96 – 97	96½– 97

Tone: Steady.

The Industries Syndicate quote latex, native produce, 60% centrifugal, packed in rectangular drums, fob at 200.20d. per gallon.

CEYLON

No. 1 RSS

The price of No. 1 RSS at Colombo on August 1 was 117½ (117½) Ceylon cents per lb.

NEW YORK

The New York rubber market ruled as under on August 1:

DEALERS' PRICES

	US cents per lb. ex-dock	
	Aug. 1	Previous
No. 1 RSS, Aug. ..	37⅞a	37⅝n
Sept. ..	37¼a	37⅛n
No. 2 RSS, Aug. ..	37⅞a	37⅝n
Sept. ..	37¼a	37n
No. 3 RSS, Aug. ..	37⅞a	37⅛n
Sept. ..	36⅞a	36⅝n
No. 1 RSS, Spot ..	38n	Unquoted
No. 3 amber blanket crepe, Oct. ..	33⅛n	33⅛n
No. 1 latex thin crepe, Aug.	39⅛n	39⅛n
No. 1 latex thick crepe, Aug.	38⅛n	38⅛n

FUTURES—REX CONTRACT

	Aug. 1	Previous Close
Sept. ..	37.38t	37.26t
Nov. ..	36.23t	36.20b–36.25a
Jan. ..	35.60b–35.75a	35.70b–35.90a
March ..	35.25b–35.50a	35.50t
May ..	35.00b–35.20a	35.10t
July ..	34.75b–35.00a	34.80b–35.10a
Sept. ..	34.50b–34.75a	34.50b–34.80a

Sales: 29. Tone: Quiet.

The holidays in London and Singapore were responsible for very slow trading conditions on the New York Commodity Exchange for rubber futures on August 1. Prices held within a narrow range. Physical rubber was extremely quiet.

AMSTERDAM

The Amsterdam rubber market ruled as under on July 25:

	Guilders per kilo	
No. 1 RMA	Aug. 1	Previous
August	3.01	3.02
September	3.01	3.02
October	2.98	2.99
November	2.97	2.98
December	2.96	2.97
October/December ..	2.97	2.98

Sales: 15. Tendency: Quiet.

DJAKARTA

Strong buyers' interest prevailed on August 1. The market closed steady and quiet.

	Aug. 1	Previous
Spot No. 1 Priok ..	38.00b	37.50b
Spot No. 2 Priok ..	37.00b	36.50b
Spot No. 3 Priok ..	34.50b	34.00b
No. 1 fine pale crepe, spot	37.00b	36.50b

NEW RABRM MEMBERS

New members of the Research Association of British Rubber Manufacturers, enrolled between June 1 1959 and July 20 1960 are: *Ordinary Members:* Rubberware Ltd.; Davies Steel Specialities Ltd.; Kay Brothers Plastics Ltd.; British Technical Cork Products Ltd.; Peradin Rubber Company Ltd.; Associated Electrical Industries Ltd.

Associate Members: British Cellophane Ltd.; Hercules Powder Company Ltd.; Watts Ltd.; 'Rubber and Plastics Age'; Vacu-Lug Traction Tyres Ltd.; The Cement Marketing Company Ltd.; Cox and Company (Watford) Ltd.; The Midland Tar Distillers Ltd.; UK Atomic Energy Authority; British Oxygen Engineering Ltd.; Standard Triumph Engineering Ltd.; and Lancashire Felt Company Ltd.

Commonwealth Members: Reid New Zealand Rubber Mills Ltd.; Ark Rubber Pty. Ltd., Australia; Defence Standards Laboratories, Australia; and Courtaulds (Canada) Ltd.

Hi-Flex Hose

A new flexible rubber hose, the Hi-Flex 1104, now being manufactured by BTR Industries Ltd., has a range of push-in end fittings. The hose is of neoprene and of flax-braid construction, and offers maximum resistance to swelling and ageing. The construction is such that the push-in end fittings will 'hold' (as in the age-old Chinese finger trick) without the use of conventional clamps or clips. The combination of Hi-Flex 1104 and these specially-designed inserts is a very useful development which allows replacement time to be cut to a minimum. The inserts can be rapidly fitted without the use of tools.

The one braid hose, suitable for use with push-in fittings, is available in bore sizes up to 1in. and will give a working pressure of 300psi. Crimped end fittings are recommended for use with two braid hose allowing working pressures up to 800psi. These are factory fitted and can be supplied to suit customers' individual requirements.

FBRAM Officers

At the annual general meeting of the Federation of British Rubber and Allied Manufacturers held in London on July 21, H. G. W. Chichester-Miles (Empire Rubber Co., and Rubber Bonders Ltd.) was elected president for 1960/61. Vice-presidents are S. D. Sutton (Veedip Ltd.) and C. H. N. Baker (Firestone Tyre and Rubber Co. Ltd.).

Industry INTELLIGENCE

Technical Data

Esso Butyl Rubber

Five recent additions to the technical data sheets issued by Esso Petroleum Company Ltd., 50 Stratton Street, London, W.1, relate to various aspects of the use of butyl rubber compounds.

TIS 33 deals with transfer moulding compounds. Specially compounded butyl rubber will flow under moderate heat and pressure, and can therefore be transfer moulded into intricately shaped articles. Examples of mouldings produced by this method are watt-hour-meters and transformer elements. Details of two recommended formulations are given, including their physical properties and a graph showing the effect of a filler system on distortion during a post cure in air at 320°F.

TIS 35 relates to high tensile strength butyl / polythene sponges which are approximately ten times as strong under tensile test conditions as conventional butyl open cell sponges. These blends with polythene are partially closed cell and have a water absorption of 70-110wt.%. Formulations for such sponges are given, together with physical properties which include compression deflection, compression set and water absorption figures.

TIS 36 is on Compounding Enjay Butyl for Dynamic Properties. Compounds for applications requiring noise, shock and vibration absorption can readily be made and their properties suitably modified by changing the filler system, oil content and degree of heat treatment. The report shows the principles behind such compounding and lists compounds classified by hardness, dynamic modulus, relative damping and Yersley resilience figures.

TIS 37 is on compounding Enjay butyl for high damping at low hardness levels and is intended to compliment the previous report.

Experience has shown that some butyl latex adhesives for fabric treatment undergo severe thickening between 3/4 days of compounding with resorcinol and formaldehyde. A method by which the useful life of such dips can be increased to over 30 days is discussed in TIS 38.

Bakelite Polythene

Bakelite Ltd., 12-18 Grosvenor Gardens, London, S.W.1, have recently introduced a new grade of polythene —Bakelite polythene high impact film resin PY.300. This has been developed to meet the growing demand for a really tough, high impact film for use in pre-packaging. Tests carried out on this material have shown that whilst producing a film of very high impact strength, the extrusion characteristics remain excellent.

Details of the processing characteristics on film properties are given in an advanced information sheet.

The impact strength was assessed by a simple bag drop test in which heat sealed bags filled with sand were dropped from varying heights. Bags produced from PY.300 will, because of their opening characteristics and stiffness, handle easily on all types of bag filling equipment.

Publications

Plastics on the Farm

A number of applications of plastics in agriculture and horticulture are given in a leaflet published by BX Plastics, Higham Station Avenue, E.4.

Uses of Bexthene (polythene, in continuous sheet of layflat) and Velbex (flexible vinyl) are described. Hayrick covers, pond linings and the packaging of vegetables are among suggested applications.

Quicklock

The Leeds and Bradford Boiler Co. have issued a booklet dealing with their 'Quicklock' patent safety door for autoclaves and pressure vessels. The design consists of a series of latches or triggers pivoted about the main bolts, which hold the keep ring. In turn, this withstands the load due to the internal pressure on the door plate. The bolts themselves are kept permanently tight.

The trigger tails all pass through holes in an operating ring, a small movement of which is sufficient to lock or unlock the door.

The booklet shows the wide range of uses to which the doors are applied, and goes on to describe a number of safety devices: the Surelock, the Mustlock, the Checklock, and the Wontlock. Laboratory autoclaves are also covered in this publication.

Monsanto Polythene

Two technical service bulletins recently issued by Monsanto Chemicals Ltd. relate to Polythene. The first of these, M3/1 on chemical resistance, lists almost 400 reagents and chemicals and states whether the chemical resistance of polythene is satisfactory or unsatisfactory. Included as unsatisfactory are many chemicals which show only slight attack under certain restricted conditions. This is felt to be the safe course in view of the wide variety of applications and end-use conditions encountered in practice.

Bulletin M2/1 is devoted to a description of the apparatus and method used to test the impact strength of polythene film. This consists of a simple drop test and provides a quick and reproducible method of determining the impact strength of films up to 10mil. in thickness, and gives good correlation with service performance. The value determined is the load at which 50% of the specimens fail when tested, and the values obtained clearly reflect differences resulting from the type of base resin used and from the film fabricating conditions.

Machines, Materials and Equipment

Swivel Handle Pliers

A novel pair of pliers has been introduced to facilitate access to components in difficult places. Its jaws can be swivelled through a full 360° and locked at an angle to the handle; indexed locking positions are provided at each 45°.

Removal of the locking screw allows the jaws to be taken out and replaced with a different pair. Pairs of jaws designed for a variety of purposes are available.

Measuring Small Holes

A simple instrument for measuring the diameters of small holes has been developed for use with the orifices of oil burner jets and similar equipment.

The equipment uses the principle of engaging a tapered measuring needle in the hole, and is so designed that the depth of engagement can be read off directly on a scale which is calibrated to give the diameter of the hole in thousandths of an inch. The measuring needle and the reference abutment surface are of hardened and ground tool steel to ensure accuracy and robustness.

A standard set of eight gauges covers the range 0.010in. to 0.5in. diameter, and metric calibrations are also available.

Restoring Files

A new chemical process has now been developed which provides an improved restoration treatment of worn files of all types. Tests have shown that files can be restored two or three times by this process without loss of efficiency; the original temper is not affected in any way and strength is unimpaired. Considerable financial saving is claimed for this process as the average cost of restoration is approximately 50% of the cost of a new file. The service is provided by File Restorers Ltd.

Synthetic Rubber Prices

Prices of synthetic rubbers appear regularly in RUBBER JOURNAL AND INTERNATIONAL PLASTICS *in the first week of each month. It will be appreciated if suppliers will give notification of any price changes or additions to their range. C.i.f. duty paid quotations are subject to slight variation due to exchange, ocean freight and insurance fluctuations. Prices are in pence per lb., except where otherwise stated. Grades are expressed as follows:* 1001/2/6 = *grades* 1001, 1002 *and* 1006.

(e-qdp)—Ex-quay duty paid (cifUKdp)—cif UK duty paid (e-i)—Ex-installation (ddp)—Delivered duty paid (e-sUK)—Ex-store UK (ex-wUK)—Ex-warehouse UK (d)—Delivered BM—black masterbatch CBM—cold, black masterbatch CNP—cold, non-pigmented CNS—cold, non-staining COE—cold, oil extended COELC—cold, oil extended, light coloured CO/BM—cold, oil/black masterbatch CPOE—cold, pigmented, oil extended CRE—cold, rosin extended dw—Dry weight HN—high nitrile HNP—high nitrile, powder HP—hot, pigmented HS—high styrene HMW—high mol. wt. LMW—low mol. wt. MHN—medium high nitrile MLN—medium low nitrile MMW—medium molecular weight MN—medium nitrile NS—non-staining TS—total solids RTV—room temp. vulc.

SBR TYPES AND HIGH-STYRENE RUBBER

Ameripol (Goodrich Gulf) (e-qdp) (min., 70,000-lb. lots)

1000/1	Hot, Non-Oil	23.1
1002/6/7	,, ,,	23.34
1009/11	,, ,,	23.71
1012	,, ,,	23.24
1013	,, ,,	23.94
1500/1/2	Cold, Non-Oil	23.1
1703	COE, 25% Oil	*20.31
1705	,, ,,	*20.07
1707/8	,, 37.5% Oil	*18.89
1710/12	,, ,,	*18.66

*Under 70,000 lb., min. 600 lb.

ANIC (cif UK dp)

1500	22.25
1502	22.25
1708	18.00
1712	17.75

ASRC (American Synthetic Rubber Corpn.) (cifUKdp*) (carloads lots of 30,000 lb.)

1000/1/4/6	Hot, Non-Oil	23.99
1009	,, ,,	24.61
1018	,, ,,	26.74
1019	,, ,,	26.26
1500/2	Cold, Non-Oil	23.99
1503	,, ,,	26.02
3110	,, ,,	25.78
1703	COE	20.69
1708	,,	19.27

*US/£ conversion rate $2.80

Cariflex (Shell Chemical) (e-sUK)

S-1000	Hot	22.25
S-1002	,,	23.375
S-1006	,,	22.25
S-1009/11/13	,,	24.0
S-1100	Hot/black	19.75
S-1500/2/9	Cold	22.25
S-1600/2	Cold/black	19.625
S-1605	,, ,,	19.375
S-1703	COE	20.25
S-1707	,,	18.0
S-1709/12	,,	17.75
S-1803	COBM	17.875

FR-S (Firestone) (esUKdp*)

1000/1/4/6/7	Hot	22.25
1500/2	Cold	22.25
146	,,	22.25
1710/12	OE	17.75
184	,,	17.75
178	,,	18.0
1009	cifUK Specialty	24.75
1010	,, ,,	26.0
1012	,, ,,	24.25
1013	,, ,,	25.0
1014	,, ,,	28.125
1015	,, ,,	28.75
141	,, ,,	28.625
181	,, ,,	24.125
182	,, ,,	25.0
158	,, ,,	29.5

*US/£ conversion rate $2.80

Int. Synthetic Rubber (d)

Intol 1500/2	22.5
Intol 1509	22.5
Intol 1570	22.5
Intol 1006	22.5
Intol 1710	18.0
Intol 1712	18.0
Intol 1778	18.25

Naugapol (Naugatuck Chemical) (e-sUK)

1016	28.0
1018	28.5
1019	28.0
1022	30.75
1023	32.75
1503	27.75
1504	34.0
6101	26.25
6102	27.75
K-45	30.5
K-50	31.25
KO-50	29.0

Philprene (Phillips) (e-qdp*)

1000/1/6	Hot, Non-Pig	23.28
1009	,, ,,	24.69
1010	,, ,,	25.86
1018	,, ,,	26.80
1019	,, ,,	26.33
1100	HP	19.65
1104	,,	19.28
1500/2	CNP	23.28
1503	,,	26.1
1601	CP	19.56
1605	,,	19.28
1703	COE	20.23
1706	,,	19.94
1708	,,	18.82
1712	,,	18.58
1803	CPOE	17.78
1805	,,	15.99

*US/£ conversion rate $2.81½

Plioflex (Goodyear) (ex-wUK)

1006	HNP	22.25
1500/2/7/8	CNP	22.25
1006	S	22.75
1703	COE	19.25
1710/12	,,	17.75
1773	COELC	19.25
1778	,,	18.0
B—6		27.5
B—5		28.0

Polysar (Polymer UK) (e-sUK)

S Hot	22.25
S-630 Hot	22.25
Kryflex 200 Cold	23.5
Krylene	22.25
Krylene NS	22.25
Krylene 602 Cold	22.25
Krynol 651 COE	17.75
Krynol 652 ,,	18.0
S-X 371 Process Aid	24.0

Synpol (Texas-US Chemical) (e-qdp)

1000/1	Hot	22.25
1002	,,	22.47
1006/7	,,	22.25
1009	,,	22.81
1012	,,	22.38
1013/61	,,	22.25
X274	,,	23.45
8000	,,	22.25
1500/02/51	Cold	22.25
1703	COE	19.25
1707/8	,,	18.0
1711	,,	17.88
1712	,,	17.75
8200	,,	18.0
8201	,,	16.6
8202	,,	16.38
8152	CBM	18.6
8151	COBM	18.2
8253	,,	15.84
8254	,,	15.45
8255	,,	14.8
8267	,,	16.4

(Masterbatch prices US cents per lb. fas Gulf ports)

SBR LATICES

Copo (Copolymer) (cifUKdp) (10-ton lots)

2101	(dw)	46.3
X-765	,,	40.8
X-800	,,	37.2
2102/5	,,	38.0

Naugatex (Naugatuck Chemical) (ex-wUK)

J8174	39.5
2000/1/2	40.0
2006	48.5
2105/7	40.0
2108	42.25
2711/4	39.75
2733/4	40.25
2740	45.25
J8535	38.75
2113	39.25

Pliolite Rubber (Goodyear) (d)

2000	40

Latex (dw)

2001/4/5/8	40
5350	40

Pliolite Resin (Goodyear) (d)

101A	(dw)	44
150	,,	50
151	,,	35
160	,,	50
170	,,	50

Hycar (B. F. Goodrich) (ddp)

2507 (HS) dw	48

Polysar (Polymer UK) (e-sUK)

Latex, type IV	32.5 TS
Latex, type 722	31.75 TS
(Non-returnable 45-gallon drums)	(e-i)
Latex, type 722 (bulk quantities)	28.75 TS

Int. Synthetic Rubber (ex-wks)

Intol Latex M23B/R23/F28	22.25
Intol Latex 62A	27.0

Dylex (Koppers Int. CA) (fas)

K-42A/52/31/900	31.6

ACRYLONITRILE TYPES

Butaprene N (Firestone) (cifUKdp)

NL	52.5
NAA	56.25
NF	51.5
NXM	60.18

Chemigum (e-s

N—1	75
N—3A	52
N—5	52
N—6G/7/8/600X	45

Hycar (British Geon) (UKd) (500-lb. lots and over)

1001	High Nitrile Hot	52
1041	,, ,, Cold	52
1002	MHN Hot	45
1042	,, Cold	45

Hycar (B. F. Goodrich) (ddp) (500-lb. lots and over)

1411	HNP	66
1432	MHN (crumb)	64
1072	,, (carboxyl)	66
1312	,, (liquid)	55
1043	MLN	51
1014	Low Nitrile	61

I.C.I. (min., 5-cwt. lots) (UKd)

Butakon A-4051 HN Cold	52
Butakon A-3051 MN Cold	45
Butakon A-3002 ,, ,,	45

Paracril (US Rubber) (dwe-sUK)

18-80	Low Nitrile	61
AJ	,,	50
B	MLN	51
BJ	,,	51
BLT	,, Cold	51
BJLT	,, ,,	51
C	MHN	59
CLT	,, Cold	59
CV	,, (crumb)	63
D	High Nitrile	67
ALT		51
OZO		47

Polysar (Polymer UK) (d)

Krynac 800 MN	45
Krynac 802 LN	45
Krynac 803 MN (low Mooney)	45
Krynac 801 HN	52
Krynac 804 (MN-cross linked)	45

ACRYLONITRILE LATICES

Buta prene N (Firestone) (cifUKdp)

N-300 (dw)	53
N-400 ,,	60.5

Chemigum Latex (Goodyear) (d)

200	(dw)	65
235/6	CHS ,,	60
245	B ,,	52
245/6/7/8	CHS ,,	52

Hycar (B.F. Goodrich) (ddp) (dry weight, drum lots)

1551 High Nitrile	66
1552 MHN	57

Hycar (British Geon) (UKd) (dry weight, 3 drums and over)

1561	High Nitrile	60
1571	,, ,, (carboxyl)	60
1562	MHN	52
1577	,, (modified)	52

Nitrex (Naugatuck Chemical) (e-sUK)

J6849	56.75
2612	53.75
2616	63.0
2619	62.75
2620	55.5
2625	54.5
2625-A	54.5

ACRYLIC TYPES

Hycar (B. F. Goodrich) (ddp

4021 Slab, 500 lb. and over	144
4501 Latex, dry weight	96

BUTYL TYPES

Esso (e-sUK

Regular 035/150/215	21.75
Regular 217/8	21.75
Regular 325	21.75
Non-staining 065	22.75
Non-staining 165	22.75
Non-staining 265/7/8	22.75
Non-staining 365	22.75

Vistanex (Polyisobutylene) (e-qdp

MS	LMW	54
MH	,,	54
L-80	MMW	54
L-100	,,	54
L-120	,,	54
L-140	,,	54

Polysar (Polymer UK) (e-sUK)

Butyl 100/200/300		21.75
Butyl 301/400	NS	21.75
Butyl 101	NS	26.25
Butyl 402	NS	22.5

Hycar (B. F. Goodrich) (ddp (500 lb. and over)

2202 Brominated	68

NEOPRENES

(ddp

W and WHV	(dwdel)	42.62
WRT	,,	48.37
WX/GN/GNA	,,	44.62
GRT and S	,,	45.62
AC	,,	57.125
KNR	,,	75.62
AC 'M' and 'S'	,,	57.125
CG/AD	,,	57.125

Latices—Dry (per lb. del, min., 50 lb.)

571	49.75
842A	49.75
572	51.25
601A	51.87
650	54.125
735	51.25
736	51.25
950	58.25
60	51.87
750	51.25
635	53.62

SILICONE RUBBERS

Midland Silicones (500-lb. lots del)

Stocks	16s. 6d. to 35s.
Pastes	26s. to 35s.
Gums and base stock	36s. to 42s.
Cold-curing silicone rubber	20s. and 23d. 6d.

I.C.I. Silicones

Gums (40-lb. lots del)	39s. 6d.-47s.
Stocks (250-lb. lots del)	22s.-35s.
Pastes (1000-lb. lots del)	27s.6d.-35s.9d.
Silcoset (RTV) (250-lb. lots del)	21s. to 24s.

REINFORCING RESINS AND RUBBERS

I.C.I. (min., 2-ton lots) (UKd)

Butakon S-8551	36.5
Butakon S-7001	33.5

Hycar (B.F. Goodrich) (ddp

2007 (powder)	42.5

Pliolite (Goodyear) (d)

S—6B	36.5

Polysar (Polymer UK) (e-sUK)

SS-250 HS (bale)	27.25
SS-250 ,, (flake)	27.5
Kryflex 252 HS	25.5
Kryflex 202 (HMW Cold polymerized)	25.75

Cariflex (Shell) (e-sUK)

SP-103	28.0

Cyclite (Durham Raw Materials) 42

HYPALON

(ddp)

20	48
30	60.25
40	50.75

Companies in the News

Formica

Formica Ltd. had an excellent year, said B. C. Westall in his annual report on The De La Rue Co. Ltd.

The Tynemouth factory has worked at full capacity, and extensions have now been made to increase production. Many new projects had been handled by the research and development department, and a new product—Beautyboard was launched.

Formica International Ltd. contributed the biggest share to the group's profits: £1.8m.

Johnson Matthey and Co.

Demand for Johnson Matthey's cadmium pigments is exceeding supply. A site at Kidsgrove, four miles from the two present producing centres at Burslem has been bought for expansion, the chairman said in his annual report. The capital cost of this new development is put at between £180,000 and £200,000. Net profit for the group for the year ended March 31 was £834,650 after tax.

RFD Co.

The RFD Co.'s profit over 15 months amounted to £165,289 in what the chairman, Alan Noble, called a difficult period. Reduced demand was due to the recession in the shipping industry (the company produces liferafts and similar equipment). A revival of demand is expected, since the International Convention for Safety of Life at Sea has made favourable recommendations for the equipment of new ships with inflatable liferafts.

Goodyear

Goodyear Tire and Rubber has announced that net sales during the first half of 1960 amounted to $815.8m. against $812.7m. in the corresponding period of 1959, equal to $1.13 compared with $1.22.

Chembong

A sharp increase in earnings leads Chembong Malay Rubber Co. (1920) to raise its total dividend to 35% from 15%, with a final of 27½% (10%). Profits are more than doubled at £124,690 (£56,260), before tax of £48,400 (£19,200).

Dupont

E. I. Dupont de Nemours and Company report second quarter net sales and operating revenue of $568.7m., equal to $2.22 a share.

PTFE Seals Pipes

A very simple means of sealing screwed pipe joints is provided by the use of PTFE tape. A layer of tape is laid tightly round the male thread before the joint is tightened.

A small amount of cold flow under pressure allows the tape material to take up the shape of the threads, even if they are imperfectly formed. The tape does not gall or seize, and because of its low coefficient of friction, joints are easily tightened and can easily be broken down after a long period of time.

Joints can be made effective over a wide temperature and pressure range and the sealing material is inert to all chemicals except molten alkali metals and gaseous fluorine.

MS 4 Price Cut

12–17% cuts in the price of silicone insulating compound MS 4 have been announced by Midland Silicones Ltd. The reductions amount to 6s. 9d. per lb. for 100lb. drums to 8s. per lb. for 8oz. and 2oz. tubes.

The company says that reduced manufacturing costs already resulting from rapidly increasing sales have contributed to a substantial extent towards the price reduction, which is now effective.

MS 4 is a smooth silicone grease with the consistency of petroleum jelly. It retains its consistency at temperatures as low as −50°C. and as high as 200°C. Originally developed to exclude moisture from aircraft ignition systems, excellent dielectric properties are claimed for it, together with a high order of water repellency. It lubricates rubber, plastics and other surfaces.

QUICK PIPELINE

The problem of laying a fresh water supply to a farm, an inn and two boat yards on the banks of the river Bure near the Norfolk Broads has been solved by using a 2in. Class B pipe manufactured from Chemidus 3000, a new piping material which is finding increasing favour with water engineers. Chemidus 3000 is made from Shell Chemical's Carina PVC.

Because of the semi-flexible nature of the material, the pipe can be jointed before being lowered into the trench. A narrower trench than would normally be required for conventional materials can therefore be used, resulting in substantial economies both in digging and back-filling. Although twelve dykes had to be negotiated and the land is very muddy, the whole 1,200 yards of pipe was laid within 48 hours.

PVC ABC

The development and expansion of the PVC industry in Japan has been rapid, and production for 1959 was in excess of 20,000 metric tons, more than double the 1958 figure. Such (to quote a publication recently received from Japan) is 'the amazing eversoaring situation of this versatile material' that the Japan Rigid PVC sheet Association has just published a booklet entitled 'ABC of Rigid PVC Sheet Processing.'

Mr D. T. Lewis has retired from the board of The Kuala Reman Rubber Estates Ltd. after 33 years' service. He is succeeded by Mr G. T. Walden, F.C.I.S., who has been appointed a director as from August 1 1960.

Which mother uses the neoprene-proofed nylon jerribag? The 4-gal. container, made by Fireproof Tanks, Portsmouth, shown here holds almost exactly the same quantity of liquid as a conventional metal one, but weighs only 1¼lb. instead of 10lb.

Made by John Morris of Wickham, this figure has been cast into a plaster mould using Araldite epoxy resin reinforced with glasscloth. It has been made for a new Gateshead church. A filler added to the resin gives the casting a marble appearance

Synthetic Exhibition

The provisional lecture programme for the 1960 International Synthetic Rubber Symposium and Exhibition at Church House, S.W.1, has been released. Lectures are:

New Controlled Structure Polymers of Butadiene (Dr W. W. Crouch—Phillips); Rheological Properties of *cis*-Polybutadiene and Other Polymers (Dunlop); Polybutadiene Rubber (Dr E. F. Engel—Chemische Werke Hüls); High Solids SBR Latex by a Chemical Promoted Agglomeration (Dr L. H. Howland, E. J. Aleksa, Dr R. W. Brown, E. L. Borg—Naugutuck Chemical Division, US Rubber Co.); The Dynamic-Mechanical Properties of Filler-Loaded Vulcanizates (A. R. Payne—RABRM); Tread Wear Indices of Various Synthetic Elastomers Measured in Varying Severity Road Tests (R. L. Marlowe, R. F. Miller, J. L. Ginn—B. F. Goodrich Co.); Polyisoprene Rubber (Shell Chemical Co. USA); Vulcanization and Elastomeric Properties of Ethylene-Propylene Copolymers (Professor Guilio Natta); Preparation and Properties of Chlorobutyl (Dr F. P. Baldwin—Esso Research and Engineering Co.); Silicone Rubber Compounding (P. C. Servais—Dow Corning Corp. and Dr I. H. Riley—Midland Silicones Ltd.); Modern Nitrile Rubber Technology (H. A. Pfisterer, I. W. E. Harris—Polymer Corporation Ltd.); The Chemistry and Vulcanization of 'Viton' Fluoroelastomers (G. T. Perkins, Dr J. F. Smith—E. I. du Pont de Nemours Inc.); Elastomers for Advanced Design Flight Vehicles (R. E. Headrick — Wright Air Development Centre); Relationship of Intrinsic Viscosity to the Intrinsic Vistex Viscosity and Plasticity of Cold Styrene-Butadiene Rubber (E. W. Duck, J. A. Waterman—Kon./Shell Laboratory); Mechanisms of the Stereospecific Polymerization of Dienes (Professor C. E. H. Bawn—University of Liverpool); Carbon Black Structure Effects in Synthetic Rubbers (T. D. Bolt, E. M. Danenberg, R. E. Dobbin, R. P. Rossman—Godfrey L. Cabot Inc.); and Effect of Structural Imperfections on Certain Properties of Stereo Rubbers (K. W. Scott, G. S. Trick, R. H. Mayor, Wm. Saltman, R. H. Pierson—Goodyear Tire and Rubber Co.).

Mr J. C. G. Boot, who is a director of Shell International Petroleum, is leaving that board to become a director of Bataafse Internationale Petroleum Maatschappij N.V. His office as Dutch-Shell Group Personnel Co-ordinator will be in The Hague, and not in London.

TRADE MARKS

Objections to the registration of any of the undermentioned applications may be lodged with the Comptroller-General of Patents, Designs and Trade Marks at the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, within one month of the date mentioned. The objections must be stated on Trade Marks Form No. 7, cost £2, obtainable through any money order office. The extracts—from 'The Trade Marks Journal'—given below are reproduced by permission of the Controller of H.M. Stationery Office.

PALATAL (799,624) Chemical products, and plastics in the form of chips, powders, granules, solutions, emulsions and dispersions, all for use in manufacture. Badische Anilin- and Soda-Fabrik A.G., 38 Friesenheimer Strasse, Ludwigshafen-on-Rhine. Address for service is c/o J. Y. and G. W. Johnson, 47 Lincoln's Inn Fields, London, W.C.2. (Class 1; May 10 1960).

TOOTAL (796,144) All goods included in Class 7 made wholly or principally of plastics. Thermo Plastics Ltd., Luton Road Works, Dunstable, Bedfordshire Associated with 796,146. (Class 7; May 10 1960).

ALKATHENE

(799,053) Articles included in Class 20 made of plastics. Imperial Chemical Industries Ltd., Imperial Chemical House, Millbank, London, S.W.1. Associated with No. 749,616 (4062, 397) and others. (Class 20; May 10 1960).

CHINUKE (799,430) Draught excluders made wholly or principally of plastics for windows and doors. N. H. Craston Ltd., Station Buildings, Oldfield Road, Altrincham. (Class 11; May 10 1960).

ANDRECON (800,251) Articles made from rubber or from synthetic rubber and included in Class 17. Andre Rubber Co. Ltd., Kingston By-pass, Surbiton, Surrey. (Class 11; May 10 1960).

BRENCAR (798,765) Insulating covers made of plastics, for use in retaining heat in swimming pools. Brenda Ruby Carter, Wakeham, Rogate, Petersfield, Hampshire. (Class 11; May 10 1960).

PALATAL (799,677) Plastics in the form of foils, plates, rods, blocks, bands and profiled sections, and included in Class 17. Badische Anilin- and Soda-Fabrik A.G., 38 Friesenheimer Strasse, Ludwigshafen-on-Rhine, Germany. Address for service is c/o J. Y. and G. W. Johnson, 47 Lincoln's Inn Field London, W.C.2. (Class 11; May 10 1960).

DECORIL (799,502) All goods included in Class 19. Rubber Improvement Ltd., Rilex House, Chandos Street, London, W.1. (Class 19; May 10 1960).

DUNLOPILLO (800,736) Tiles (non-metallic). Dunlop Rubber Co. Ltd., Fort Dunlop, Erdington, Birmingham, 24. (Class 19; May 10 1960).

SEMROC (800,229) Non-metallic jointless material (not in the nature of paint) for flooring and for covering structural surfaces; and non-metallic tiles. Semtex Ltd., 1 Albany Street, London, N.W.1. (Class 19; May 10 1960).

BEX (B796,790) Non-electric domestic appliances for cleaning carpets, rugs and upholstery. The British Xylonite Co. Ltd., Highams Park, London, E.4. (Class 21; May 10 1960).

SANDURA (797,578) Floor coverings made of polyvinyl chloride plastics. Sandura Co. Benson-East, Township Line and Old York Road, Jenkintown, Pennsylvania, USA. Address for service is c/o Mewburn Ellis and Co., 70 and 72 Chancery Lane, London, W.C.2. (Class 27; May 10 1960).

NEW COMPANIES

Wilvan Products Ltd. (663,122).—June 23. Capital: £1,000 in £1 shares. To carry on the business of manufacturers of and dealers in plastic, metal, wooden and other goods, etc. The first directors are to be appointed by the subscribers. Solicitors: John E. C. Perry, Richmond, Surrey.

R. K. Plastics Ltd. (663,157).—June 23. Capital: £5,000 in £1 shares. The directors are: Ralph K. Reynolds, The Ridings, Hampton Court Way, Thames Ditton; Alec C. Bright, 167 High Street, Guildford, Surrey. Solicitors: Malcolm, Wilson and Cobby, Worthing.

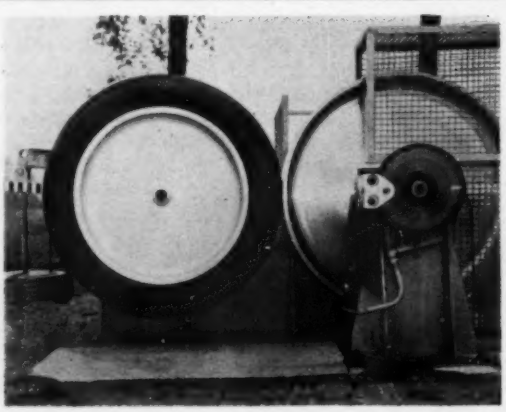
Kimbar Companies Ltd. (663,574).—June 29. Capital: £100 in £1 shares. To carry on the business of manufacturers of and dealers in all kinds of footwear and leather, plastic and rubber goods, etc. The directors are: Frederick E. Rowland, 79 Marlborough Crescent, Sevenoaks, Kent; Gordon L. Bruce, 85 Gipsy Lane, Kettering, Northants. Regd. office: Bush Lane House, Bush Lane, E.C.4.

Express Tyre Service (London) Ltd. (663,562).—June 29. Capital: £1,000 in £1 shares. The directors are: Cuthbert Mitchell, Farley, Sea Lane, Rustington; Noel S. Unsworth, The Nines, Village Way, Little Chalfont, Bucks.; Alfred B. Cheshire and Rodney G. Page. Solicitors: Graham Price and Co., S.W.1. Regd. office: 53 Cheapside, E.C.2.

Trenco Pressings Company Ltd. (663,594).—June 29. Capital: £100 in £1 shares. To carry on the business of manufacturers of and dealers in natural and synthetic rubber, etc. The permanent directors are: John Cook and Daphne Cook, both of 4 Sudbury Hill, Harrow on The Hill; William H. Dickerson, Alveston, Byfleet Road, New Haw, Weybridge. Regd. office: 100 The Arches, Ravenscourt Park, W.C.

Levity Plastics Ltd. (663,649).—June 29. Capital: £100 in £1 shares. The directors are: Donald Mather, 30a Coventry Road, Coleshill, Warwicks.; Frederick W. Weaver, 100 Coleshill Road, Marston Green, Birmingham. Regd. office: 18 Queens College Chambers, Paradise Street, Birmingham, 1.

Panafoam Ltd. (663,658). — June 29. Capital: £1,000 in £1 shares. To carry on the business of manufacturers, processors and factors of and dealers in polyurethane and other plastic, modelling and moulding materials, etc. Directors: Isaac M. Morris, 26 Elm Road, Manchester, 20. Regd. office: 51 Boothby Street, Manchester, 15.



A tyre developed for 500mph-plus speeds shows no distortion as it nears its peak speed at the Firestone Tire & Rubber Company's test station at Columbiana, Ohio. Such tyres are being used in attempts on the world land speed record. In September, Donald Campbell is scheduled to attack the record in a car equipped with Dunlop tyres

PATENT LIST

Printed copies of the Specifications in the following list, published by permission of the Controller of H.M. Stationery Office, can be obtained from the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, price 3s. 6d., including postage, but about six weeks after the date of this publication will usually elapse before they come available. Orders with remittance may be sent in advance to the Patent Office, and will be fulfilled immediately the Specifications are published.

COMPLETE SPECIFICATIONS ACCEPTED

Open to public inspection on July 13 1960

Farbenfabriken Bayer A.G. Production of high molecular weight polyurethane plastics. 840,097.

Farbenfabriken Bayer A.G. Dyestuffs for the dyeing and printing of polymers or co-polymers of acrylonitrile or asdicyanethylene. 840,282.

General Electric Co. Process of making silanes. 840,415.

Mobay Chemical Co. Process for the production of urethane polyisocyanates. 840,500.

General Tire and Rubber Co. Water-activatable adhesive coated laminated plastic sheet material. 840,417.

J. A. Benckiser G.m.b.H. Chemische Fabrik. Nitrogen-phosphorus containing polymeric products and method of making same. 840,142.

Uclaf. Diamine salts and polymers thereof. 840,204.

Onderzoekingsinstituut Research N.V. Method for the preparation of pigmented polyesters and articles manufactured from these polyesters. 840,215.

United States Rubber Co. Plastic compositions. 840,153.

Allied Chemical Corporation. Curing polyester resins. 840,021.

Scientific Design Co. Inc. Process for the manufacture of isoprene. 840,028.

E. I. Du Pont de Nemours and Co. Fluorine-containing polymers and their production. 840,080.

Esso Research and Engineering Co. Reinforced resinous polymers. 840,367.

De Bataafsche Petroleum Maatschappij N.V. Process for the preparation of diolefins by dehydrogenation of monoolefins. 840,082.

Goodyear Tire and Rubber Co. Method of preparing 1, 4 trans polyisoprene. 840,165.

J. A. Benckiser G.m.b.H. Chemische Fabrik. Production of polymeric phosphams. 840,387.

Imperial Chemical Industries Ltd. Treatment of polyethylene terephthalate filamentary textile material or textile fibres. 840,795.

Gevaert Photo-Producten N.V. Synthetic fibres, filaments and other shaped articles. 840,797.

Geigy Co. Ltd. Pigment pastes and the manufacture thereof. 841,519.

Vinyl Products Ltd. Manufacture of polymeric methacrylic acid products. 841,312.

Agricola Reg. Trust. Expanded plastic, e.g., polyurethane. 841,318.

Gevaert Photo-Producten N.V. Fibre- and film-forming polyanhydrides. 840,846.

Dunlop Rubber Co. Ltd. Reinforced laminated articles. 841,480.

Dunlop Rubber Co. Ltd. Moulds. 840,883.

Gevaert Photo-Producten N.V. Fibre- and film-forming polyanhydrides and their preparation. 840,847.

O. W. Burke. Anti-ozonant compositions for rubber and other unsaturated high polymers. 841,281.

Rohm and Haas Co. Unsaturated carbamato ethers and thioethers, polymers thereof and methods of making them. 840,891.

National Distillers Products Corporation. Alkyl esters of C_{18} aliphatic dicarboxylic acids. 840,893.

Open to public inspection on July 20 1960

Stockholms Superfosfat Fabriks A.B. Process for preparing plasticized mixtures (formulations) of thermoplastic polymers and a product prepared in this manner. 841,649.

General Mills Inc. Polyepoxy compounds. 841,589.

E. I. Du Pont de Nemours and Co. Pigmented coating compositions. 841,910.

E. I. Du Pont de Nemours and Co. Castings compositions. 841,917.

Dow Chemical Co. Process for preparing oriented thermoplastic filaments having a satiny appearance. 841,599.

A. Abbey (Dow Chemical Co.). Process of making colourless aqueuous saline solutions of polyacrylonitrile. 841,732.

Phillips Petroluem Co. Method and apparatus for control of polymerization reactions. 842,951.

United States Rubber Co. Method of making plastic foam. 841,742.

British Hydrocarbon Chemicals Ltd. Production of conjugated diolefines. 841,746.

British Hydrocarbon Chemicals Ltd. Production of conjugated diolefines. 841,747.

British Hydrocarbon Chemicals Ltd. Production of conjugated diolefines. 841,748.

Udic S.A. Lignin-modified phenolic resins. 841,749.

Esso Research and Engineering Co. Method for preparing highly crystalline poly alpha olefins. 841,807.

Lonza Electric and Chemical Works Ltd. Process extrusion of tubes of thermoplastic material. 841,808.

Metal Box Co. Ltd. Extrusion of seamless tubes of plastics material. 842,064.

B. F. Goodrich Co. Polymeric compositions. 841,977.

Montecatini Soc. Generale per l'Industria Mineria e Chimica. Processes for polymerising ethylene with the aid of organometallic catalysts. 841,679.

Chemische Werke Hüls A.G. Softening agents for polymers of vinyl chloride. 841,805.

United States Rubber Co. Increasing the particle size of synthetic rubber latices. 841,758.

Owens-Illinois Glass Co. Method of and apparatus for making hollow plastic articles. 841,550.

Latest Wills

Mr William Arthur Shaw, of 40 Burlington Avenue, Kelvinside, Glasgow, for many years Glasgow area manager for Morris Ashby Ltd., as well as that of its associate company, Columbian International (GB) Ltd., died on February 22 last, leaving personal estate in England and Scotland valued at £3,268 12s. 1d.

Mr Robert Watterson, of 250 Bramhall Lane, Stockport, former joint managing director and secretary of Phillips Rubbers (Manufacturing) Ltd., Manchester, who died on March 3 last, left £16,831 gross, £16,637 net value. (Duty paid £1,668).

Mr Henry John Tapscott, F.C.I.I., of 43 Arlington House, S.W.1, a director of Laras (Sumatra) Rubber Estates Ltd. and other companies, former chairman of the executive committee of the Anti-Slavery Society, who died on February 1, 1960, aged 81, left estate in Great Britain valued at £143,556 gross, £31,983 net value.

Mr George Appleton, of The Chestnuts, Pangbourne, Berks., managing director of Hills Rubber Co. Ltd., who died on March 12, 1960, left £23,688 gross, £23,587 net value.

Mr Alexander Strachan, of 12 Osborne Place, Aberdeen, retired rubber planter, who died on February 11, left personal estate in England and Scotland valued at £16,089.

Mr Jack Meek, of 380 Clifton Drive North, St. Anne's-on-the-Sea, Lancs., founder and chairman of J. Meek and Co. Ltd., waterproof garment manufacturers, who died on November 5, left £86,526 gross, £74,749 net.

Sir Edward Thomas Frederick Crowe, K.C.M.G., of 5 Roland Way, Old Brompton Road, S.W.7, a director of Henley's Tyre and Rubber Co. Ltd., who previously had a long career of public service, and was a former president of the Royal Society of Arts, and who died on March 8, aged 82 years, left £24,113 gross, £20,705 net value.

Solution to RJIP Crossword

(See page 209 this issue)

ACROSS. — 2, Antiseptic. 7, Ail. 8, Peptised. 10, Trace. 11, Kittens. 12, Edict. 15, Brine. 17, Incline. 18, Cafés. 19, Material. 21, Rio. 22, Argentatum.

DOWN.—1, Parthenium. 2, Alkali. 3, Tape. 4, Sophia. 5, Printer. 6, Ice. 9, Dispersion. 13, College. 14, Enlist. 16, Infirm. 18, Clot. 20, Air.

COUNTY COURT JUDGMENTS

NOTE.—*These Judgments which are supplied from the Registry of County Court Judgments, Lord Chancellor's Department, 3 Dean's Yard, London, S.W.1, are not necessarily for debt, and some may have since been satisfied. They may be for damages or otherwise, they may relate to actions bona fide contested between the parties, or they may be against defendants liable in a representative capacity and not personally; but no distinction is made on the register. A judgment does not imply inability to pay. Judgments are not returned to the Registry if satisfied in Court Books within twenty-one days.*

H. AND H. TYRES CO., 17 Union Street, Coventry, Warwicks. Coventry. £11 12s. 3d., April 19 1960.

E. G. CROISSANT, 12 Loriners, Southgate, Crawley, Sussex, plastic ceiling contractor. Horsham, £28, May 4 1960.

A. AND G. PLASTICS Ltd., Mumby's Yard, Gosport, Hants. Watford, £15, May 2 1960.

W. C. MORRISON (MALE) (Westbury Tyre Moulding Co.), Forge Works, Sherborne, Dorset. Marylebone, £21 5s. 5d., May 13 1960.

JANRICH PRODUCTS, 133 Stewart Road, Bournemouth, Hants., manufacturers of plastic goods. Bournemouth, £27, May 2 1960.

Increases of Capital

Hartex Mouldings Ltd. (575,905), 56 Meadway, Harpenden, Herts.—Increased on January 8, 1960, by £9,500, in £1 ordinary shares, beyond the registered capital of £500.

Narborough (F.M.S.) Rubber Estate Ltd. (109,273), 65 London Wall, E.C.2.—Increased on January 14, 1960, by £130,000, in 1,109,763 ordinary and 190,237 20% cumulative preference shares of 2s. each, beyond the registered capital of £120,000.

Malakoff Rubber Estates Ltd. (219,726), 149 Leadenhall Street, E.C.3.—Increased on January 22, 1960, by £35,000, in 2s. shares, beyond the registered capital of £600,000.

F. Frankenstein and Sons (Manchester) Ltd. (305,236).—Indiarubber and waterproof garment manufacturers, etc., Victoria Rubber Works, Culcheth Lane, Newton Heath, Manchester, 10. Increased on January 5, 1960, by 20,000, in £1 ordinary shares, beyond the registered capital of £100,000.

Malaya General Co. Ltd. (98,381).—To acquire estates where rubber, cocoa, pepper, etc., is grown, Orient House, New Broad Street, E.C.2. Increased on January 28, 1960, by £150,000, in 2s. ordinary shares, beyond the registered capital of £350,000.

Shell Chemical Company's Carlona polypropylene proves an ideal material for the new lavatory-chain handle currently being moulded and marketed by Wilson's 'Ataka' Products of Middlesex. The handle is made in two screw halves which incorporate a replaceable air-freshener inside

R·J·I·P·

CLASSIFIED ADVERTISEMENTS

APPOINTMENTS VACANT

6d. a word, Minimum 10/-. Box 2/-.

A SENIOR sales technician is required for seeking, initiating and assisting in the development of rubber and plastic products. The work is interesting and although primarily based in London, visits throughout Great Britain would be necessary. The technician will report up to Board level, and preferably should have both rubber and engineering qualifications. Four-figure salary, pension scheme. This is a senior position which offers scope for advancement and progressive salary increases.—Write in confidence, stating age, qualifications and previous experience, to Sales Director, William Warne & Co. Ltd., India Rubber Mills, Barking, Essex. (432)

A SSISTANT foreman required by specialised rubber manufacturers. Experience in high-pressure moulding desirable. This position offers scope for a hard-working man, with ability to reach senior status.—Details of past experience to the Secretary, Hall and Hall Ltd., Oldfield Works, Hampton, Middlesex. (438)

A VACANCY exists for a new junior staff appointment with an old established and progressive rubber hose manufacturer in Hertfordshire as a fitter engineer for supervising the assembling of low pressure and high pressure cotton and wire braided hose and other hose fitting work. Age between 30 and 40 years. Previous experience very necessary.—Apply Box 406. (406)

EUROPEAN OWNED

RUBBER CREPE FACTORY

IN NIGERIA

has vacancy for a man capable to take charge of the Technical and Production side of the factory.

Must be under 40 years of age and previous experience in a similar project in West Africa an advantage.

Free furnished accommodation.

Tours of 18 months with 3 months paid leave.

Initial salary £1,500p.a.—Box 439

(439)

APPOINTMENTS VACANT

WORKS CHEMIST

A factory in the West London area employing 185 requires a Works Chemist to be responsible for quality control, local development work, and other technical control aspects. He will be responsible to the Works Manager. A good knowledge of the rubber industry is desirable and applicants should have an O.N.C. or equivalent. Initial salary £1,000-£1,200. *Ref. No. 87.*

Please reply in confidence to:—

Robert Clive (Consultants) Limited

27 ALBEMARLE STREET, LONDON, W.1.

(443)

THE DISTILLERS COMPANY LIMITED

RUBBER TECHNOLOGISTS

The Company has two openings for rubber technologists, one in the Central Research and Development Department, Epsom, Surrey, and the other in the Research Laboratories at the Barry, Glamorgan, factory of the Plastics Division.

At Epsom the work embraces long-term research and development in the field of rubber technology; at Barry technical service work is involved, particularly the improvement of the properties of rubber compositions by the addition of synthetic resins.

Candidates, aged not over 35, must have several years' experience of rubber technology or of laboratory work in the rubber industry. They should hold a degree in Chemistry, a qualification of the Institution of the Rubber Industry, or an equivalent qualification; provided they have the required technological experience, candidates holding H.N.C. in Chemistry will be considered.

Write:

STAFF MANAGER
THE DISTILLERS COMPANY LIMITED
21-22 BOLTON STREET
LONDON W.1.

Quote Ref: 76/60 R.J. (440)

APPOINTMENTS VACANT

(continued)

PLANNING engineer required by specialised rubber manufacturers. A knowledge of variety production, involving long and short run orders, and experience in this industry desirable. Pension scheme in operation.—Send details of past experience and present salary to the Secretary, Hall and Hall Ltd., Oldfield Works, Hampton, Middlesex. (437)

VACANCY occurs for press shop chargehand on rotating shift work in rubber factory situated Middlesex. Generous salary to successful applicant. Experience of small mouldings and/or hot water bottles desirable.—Box 423. (423)

AGENCIES and REPRESENTATIVES

6d. a word, Minimum 12/6 Box 2/-

NEW market opportunity. Manufacturers or wholesale distributors of rubber, plastics and allied products desirous of exploring market possibilities in the West Indies and Jamaica in particular are invited to contact a progressive and responsible firm of manufacturers' agents interested in new lines.—Reply to E. M. Gayle, M.A., B.Ss., P.O. Box 66, Kingston, 4, Jamaica, West Indies. (256)

Donald Leaver Limited

1 LONDON ROAD, STAINES, MIDDX. Phone STAINES 55271-2

SECONDHAND PLANT AND MACHINERY (444)

MACHINERY FOR SALE

6d. a word, Minimum 12/6 Box 2/-

BLACKFRIARS 24 x 12 rotary cutter with 20 h.p. motor and starter. One complete set of spare knives, together with pneumatic take-off equipment, vibratory screen and steel staging. The above comprehensive equipment is in excellent condition and is available immediately. Price complete £800. Ex works.—Box 359. (359)

BRIDGE Banbury No. 11 with 250 h.p. drive; Intermix K4 with 110 h.p. drive; Bridge Banbury No. 3A with 110 h.p. drive; three 40in. x 16in. double geared mills.—Reed Brothers (Engineering) Ltd., Replant Works, Woolwich Industrial Estate, London, S.E.18. Tel. Woolwich 7611 (6 lines). (442)

FOR sale: Windsor 6oz. plastic injection moulding machine, 4-column horizontal type. Hydraulic operation, automatic temperature control.—Fred Watkins (Engineering) Ltd., Coleford, Glos. Phone Coleford 2271/5. (422)

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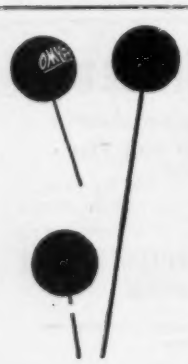

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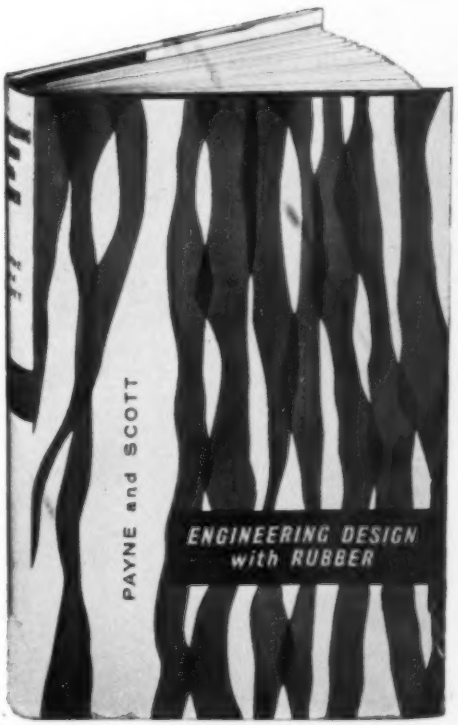

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